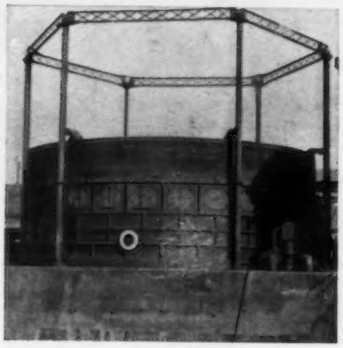
TECHNOLOGY DEPT.

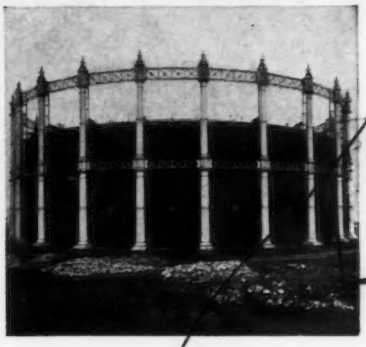
Gas Journal

VOL. 291. 109th YEAR. LONDON, JULY 10, 1957. No. 4904 PRICE 1/6

Making
GASHOLDER
History



A typical exampie of early Gasholder design erected by us in 1854.



A usual design of our large Gasholders in the eighties of last century. 100 ft. diameter. 1½ million cubic ft. capacity. Guide frame, cast-iron columns.

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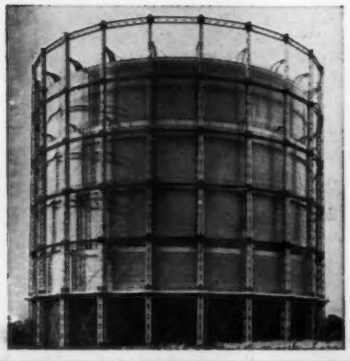

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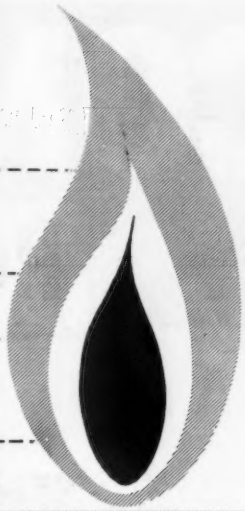

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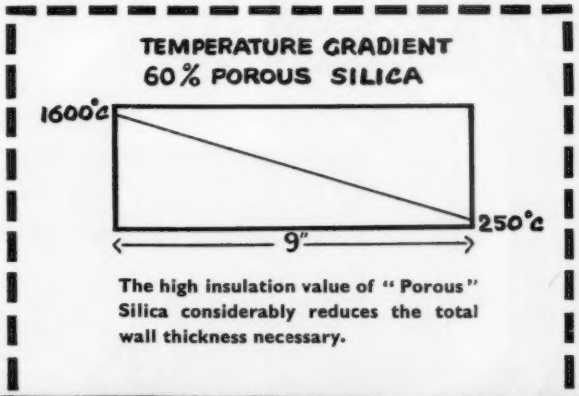

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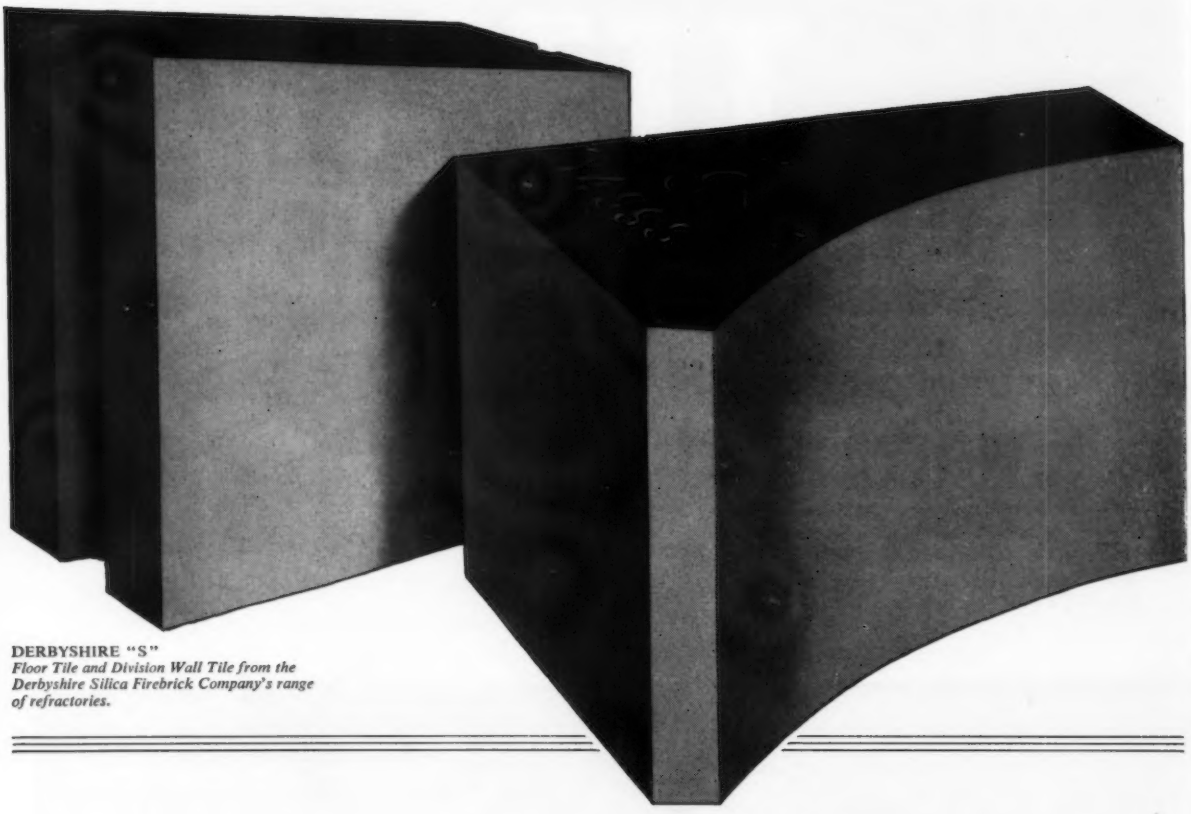

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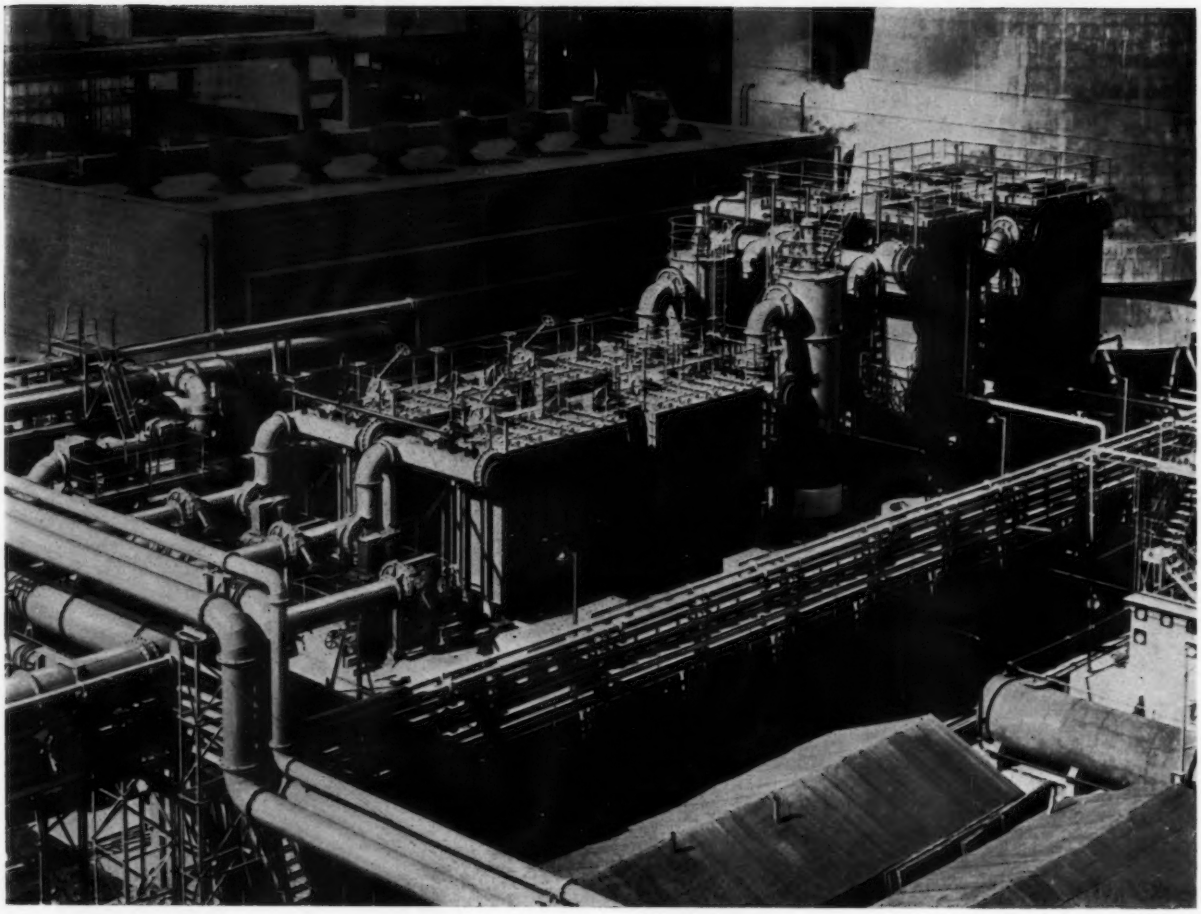

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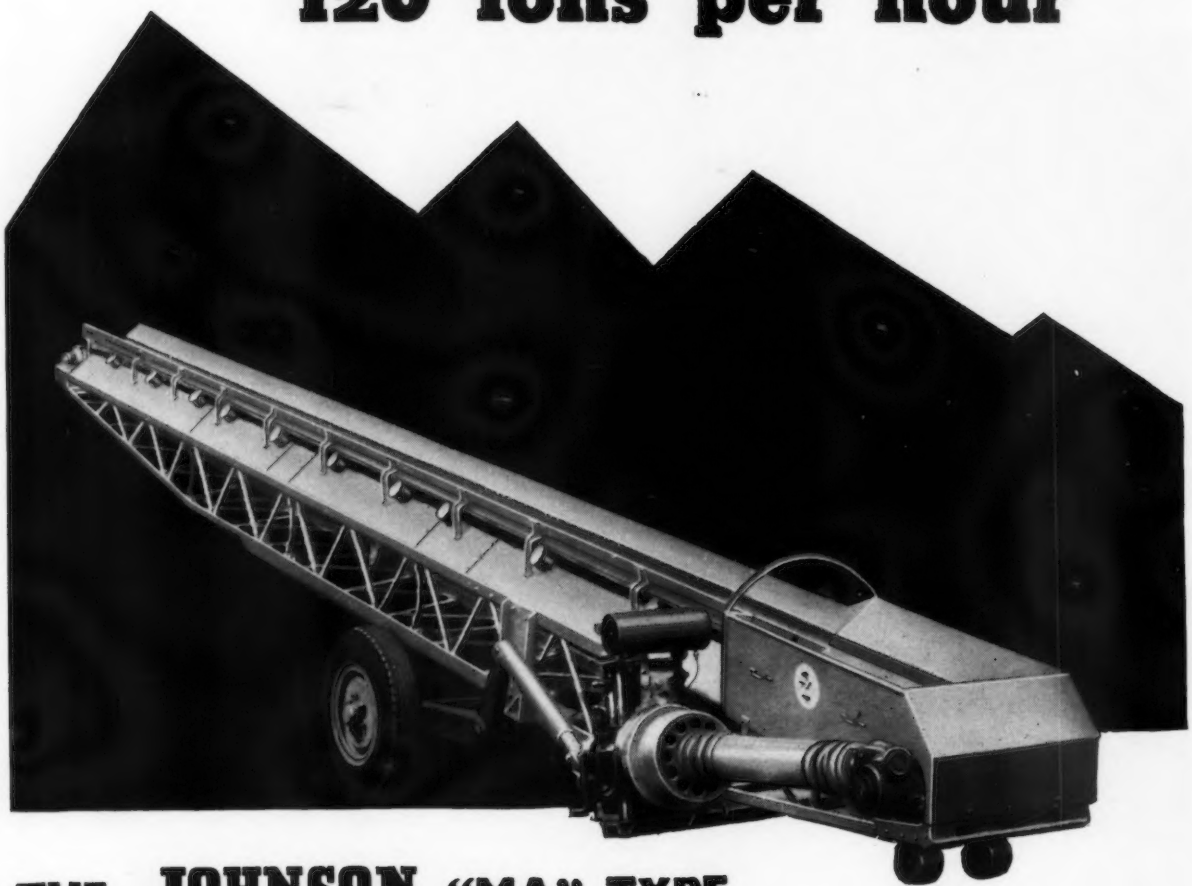

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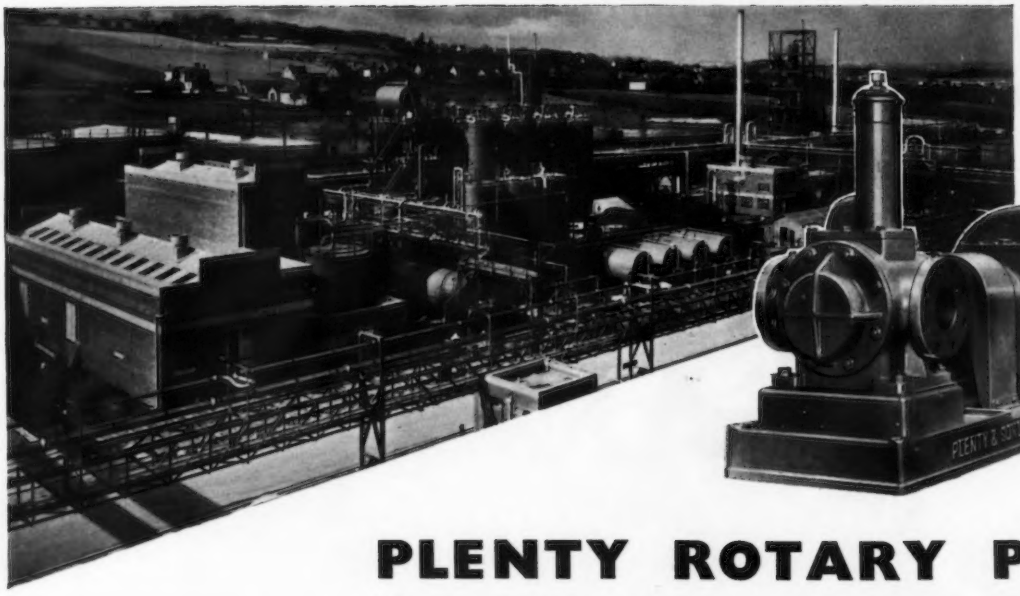

View of part of the National Coal Board's Avenue Carbonisation plant at Wingerworth, Chesterfield, Derbyshire, where a number of Plenty pumps have been supplied through Chemical Engineering Wiltons Ltd.

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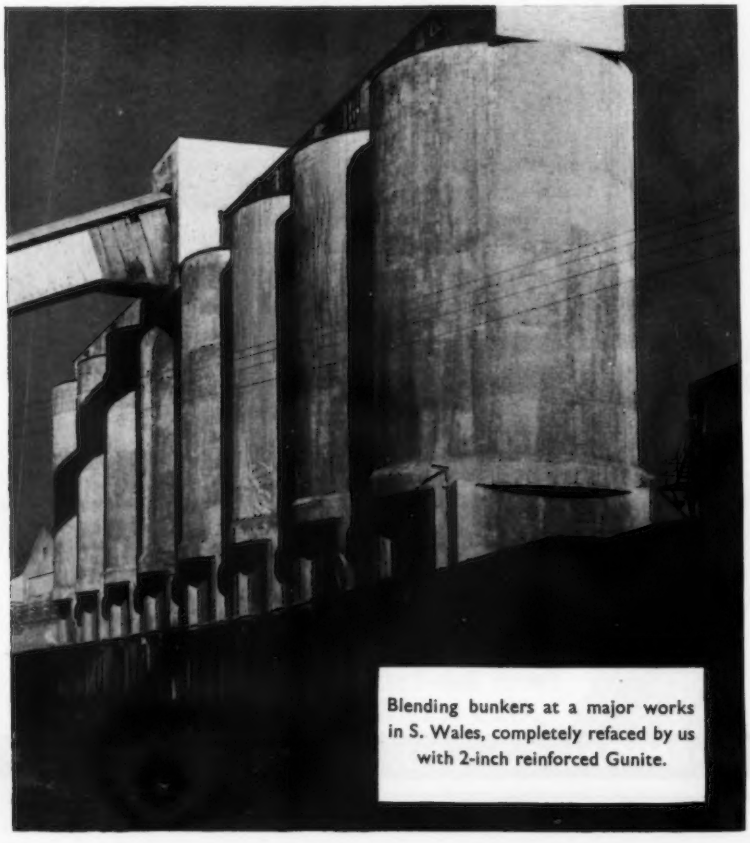

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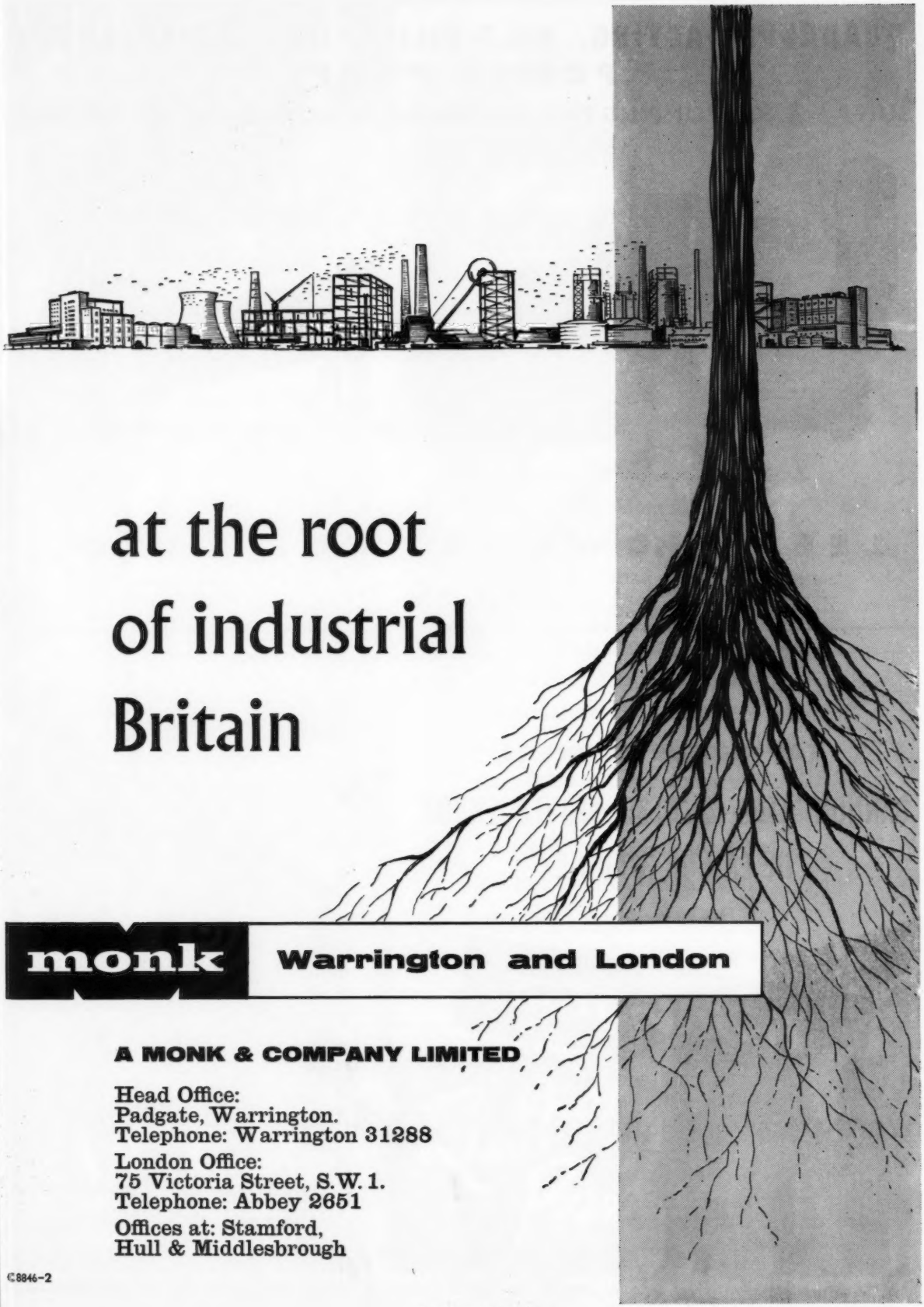

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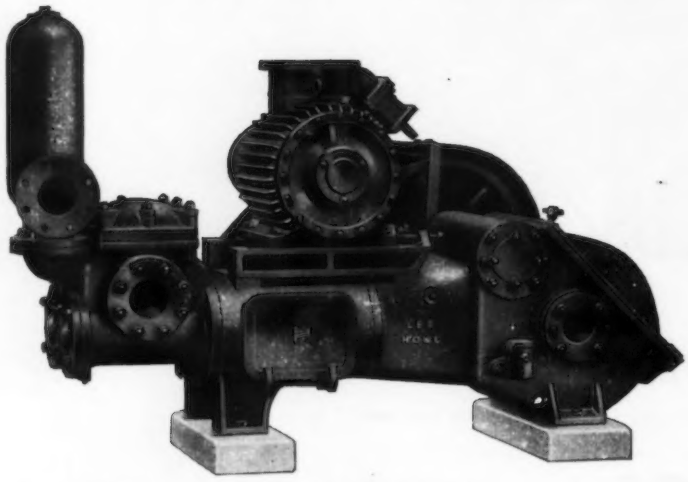

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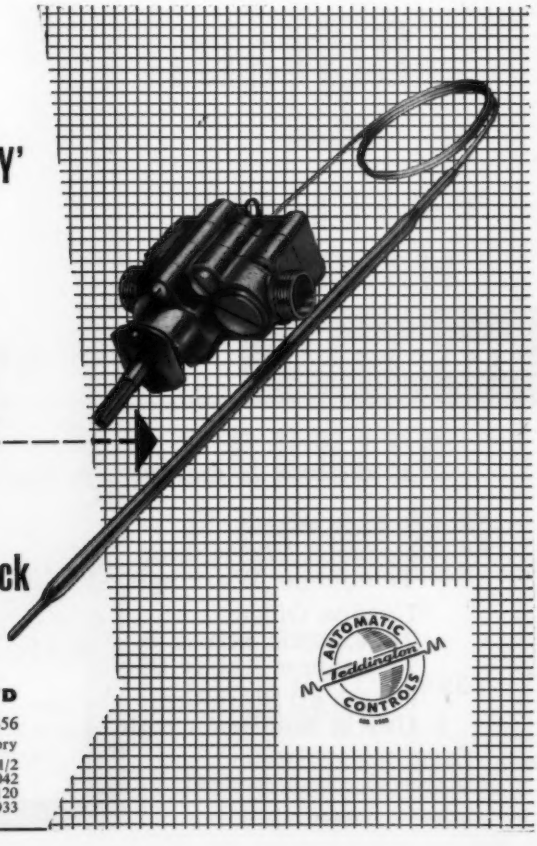

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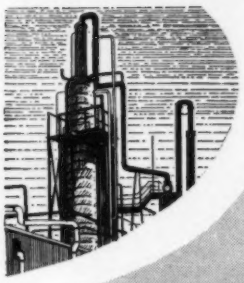

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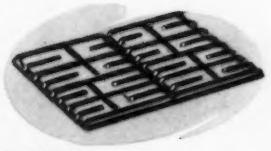

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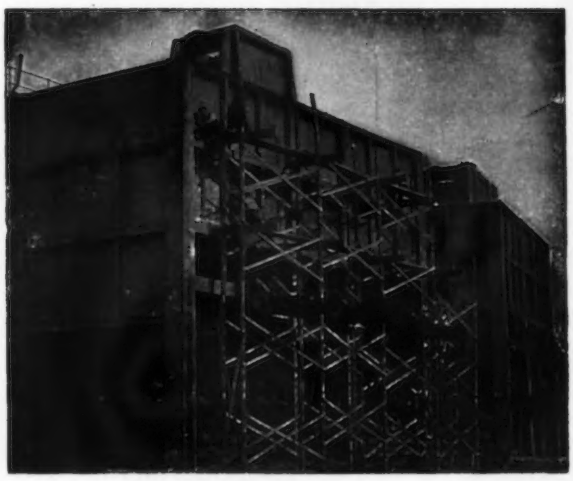

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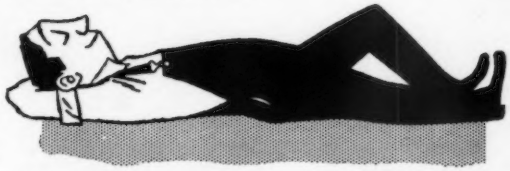

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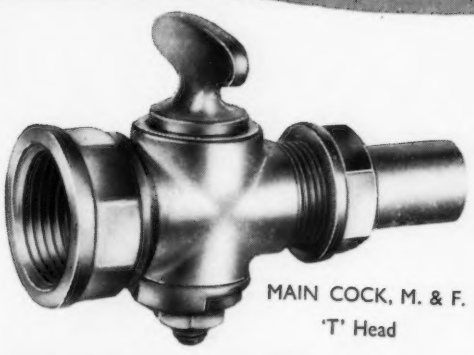

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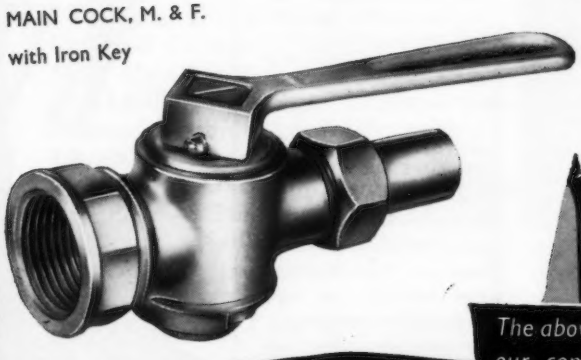

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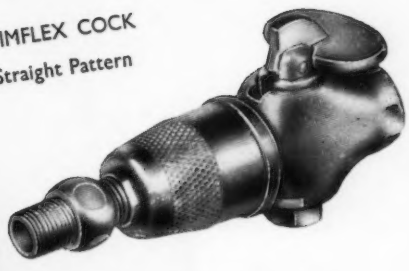

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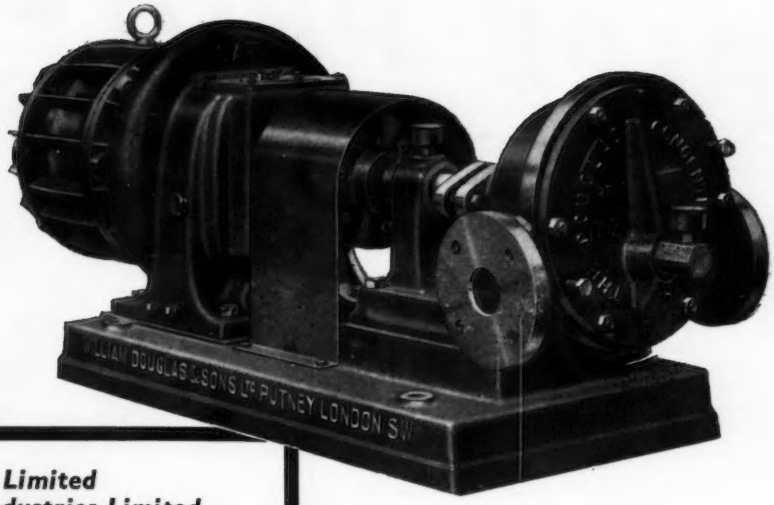

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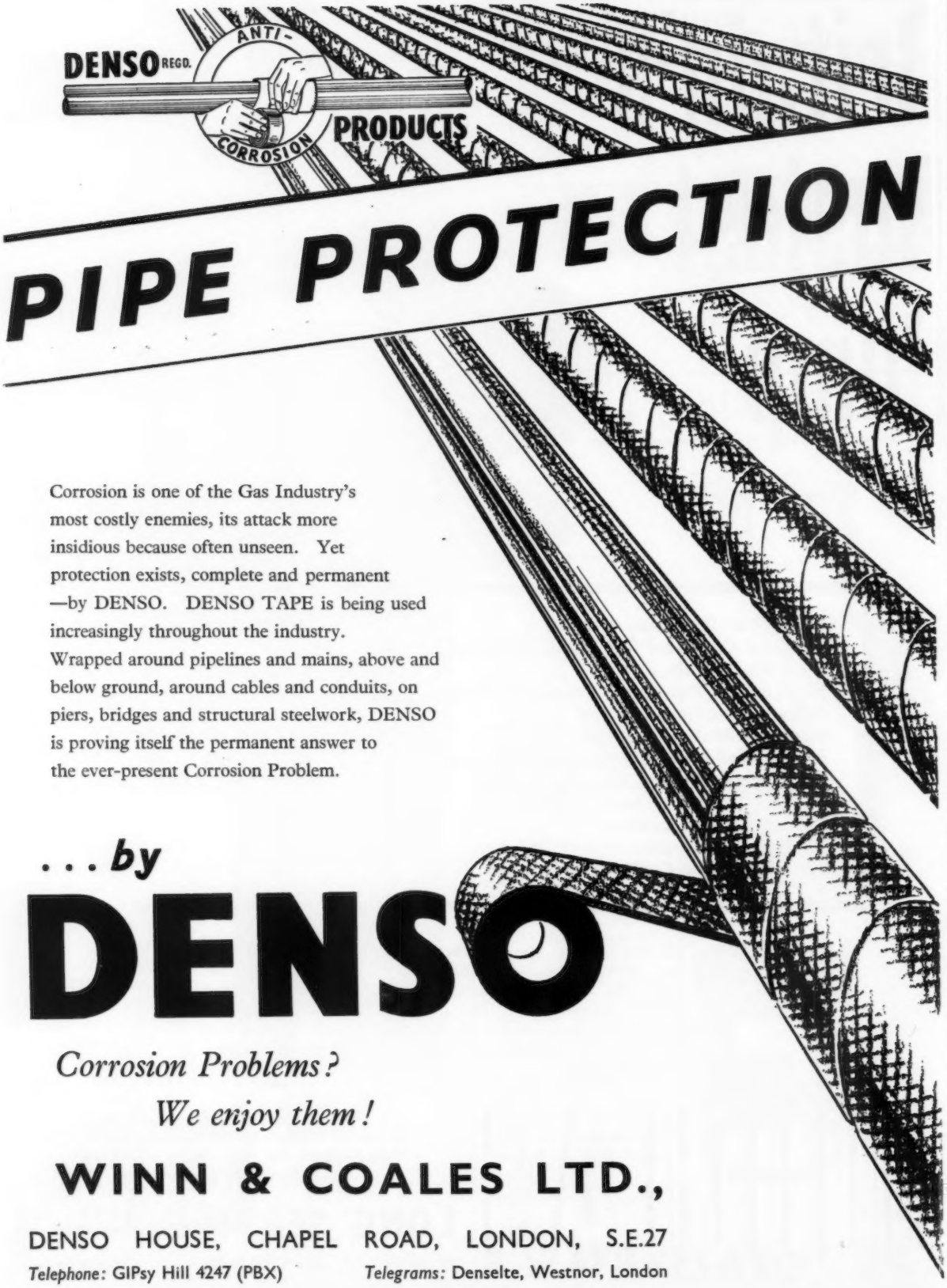

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INDEX TO 'JOURNAL' ADVERTISERS

PAGE

A

A.C.E. Machinery Ltd. ... ...
A.P.V. Company Ltd. ... ...
Abbott, Birks & Co. Ltd. ... ...
Acme Wringers Ltd. ... ...
Aerogen Co. Ltd. ... ...
Alder & Mackay Ltd. ... ...
Allen Taylor (Engineers) Ltd. ... ...
Aquafont Industries Ltd. ... ...
Ascot Gas Water Heaters Ltd. ... ...
Ashmore, Benson, Pease & Co. ... Cover IV
Ashworth & Parker Ltd. ... ...
Aspinall's (Paints) Ltd. 66
Associated Lead Manufacturers Ltd. ... ...
Atlas Preservative Co. Ltd. 65
Audley Engineering Co. Ltd. ... ...
Automotive Products Ltd. ... ...
Averill, C. R., Ltd. ... ...

B

Bale & Church Ltd. 99
Balfour, Henry, & Co. Ltd. ... ...
Bells Asbestos & Engineering Co., Ltd. ...
Berry's Foundry (1949) Ltd. ... ...
Birtley Engineering Ltd. ... ...
Blakeley, Firth, Sons & Co. Ltd. ... ...
Bolton's Superheater & Pipe Work Ltd. ...
Borchardt, F.A., Ltd. ... ...
Bratt Colbran Ltd. ... ...
Bray, George, & Co. Ltd. ... ...
Bristol Pneumatic Tools Ltd. ... ...
British Carbo-Norit Union Ltd. ... ...
British Gas Purifying Materials Co. 99
British Jeffrey-Diamond Ltd. ... ...
British LaBour Pump Co. Ltd. ... ...
British Paints Ltd. ... ...
British Rototherm Co. Ltd. ... ...
British Thomson Houston Ltd. ... ...
British Tyre & Rubber Co. Ltd. ... ...
Broadbent, Thomas, & Sons Ltd. ... ...
Broom & Wade Ltd. ... ...
Brown, J., & Co. Ltd. ... ...
Bugden, Thos., & Co. ... ...

C

Cambridge Instrument Co. Ltd. ... ...
Cannon (G.A.) Ltd. ... ...
Cementation Co. Ltd. 102
Chemical Engineering Wiltons Ltd. ... ...
Cinema-Television Ltd. ... ...
Clapham Bros. Ltd. ... ...
Clayton, Son & Co. Ltd. ... ...
Cleckheaton Engineering Co. Ltd. ... ...
Clensol Ltd. ... ...
Clifford Engineering Co. Ltd. ... ...
Cochrane (Middlesbro') Foundry Ltd. ... Cover II
Cohen, George, Sons & Co. Ltd. ... ...
Concrete Proofing Co. Ltd. 68
Consett Iron Co. Ltd. 56
Cort, Robert, & Son Ltd. ... ...
County Chemical Co., Ltd. ... ...
Crane Ltd. 68
Crone & Taylor Ltd. ... ...
Crossley Bros. ... ...
Crosthwaite Furnaces & Scriven Mach. Tools Ltd. ...
Cutler, Samuel, & Sons Ltd. ... ... Cover I
Cuxson, Gerrard & Co. Ltd. ... ...

D

Davenport Engineering Co. Ltd. ... ...
Davey, Paxman & Co. Ltd. ... ...
Davies Bros. (Denton) Ltd. ... ...
De la Rue, Thomas, & Co. Ltd. (Gas Group) ...
Demolition & Construction Co. Ltd. ... ...
Dempster, R. & J., Ltd. ... ...
Dempster, Robert, & Sons Ltd. ... ...
Denison & Son Ltd. ... ...
Derbyshire Silica Firebrick Co. Ltd. 58
Diaphragm & General Leather Co. Ltd. ...
Donkin (The Bryan) Co. Ltd. ... ... Cover II
Douglas, Wm., & Sons Ltd. 71
Drakes Ltd. ... ...
Dresser Manufactures (England) Ltd. ... ...
Drew, H. B., Ltd. ... ...
Drummond Patents Ltd. ... ...

E

Eagre Construction Co. Ltd. ... ...
Edgar, Wm., & Son Ltd. ... ...
Elcontrol Ltd. ... ...
Electric Construction Co. Ltd. ... ...
Electroflo Meters Co. Ltd. ... ...
Electrolux Ltd. ... ...
Elliott Bros. (London) Ltd. ... ...
Ether Ltd. ... ...
Evered & Co. Ltd. ... ...
Ewart & Sons Ltd. ... ...
Ewart Chainbelt Co. Ltd. ... ...

F

Fibreglass Ltd. ... ...
Fisher & Ludlow Ltd. ... ...
Flavel, S., & Co. Ltd. ... ...
Fluidrive Engineering Co. Ltd. ... ...
Ford Motor Co. Ltd. ... ...
Fowler, John, & Co. (Leeds) Ltd. ... ...

PAGE

G

Gas Purification Ltd. 99
General Electric Co. Ltd. ... ...
Gibbons Bros. Ltd. ... ...
Girdex Engineering Co. Ltd. ... ...
Glover, George, & Co. Ltd. 55
Glover, Thomas, & Co. Ltd. ... ... Facing P.87
Godfrey, Sir George, & Partners (Industrial) ...
Goodall Clayton & Co. Ltd. ... ...
Goodyear Industrial Rubber Products Ltd. ...
Grant Lyon & Co. Ltd. ... ...
Graphite Products Ltd. ... ...
Greenwood & Batley ... ...
Green & Boulding Ltd. ... ...
Gunite Construction Co. Ltd. ... ...

H

Hamilton, A. H., & Co. Ltd. ... ...
Hardman & Holden Ltd. ... ...
Harris & Pearson Ltd. ... ...
Harris Engineering Co. Ltd. ... ...
Harrisons (London) Ltd. ... ...
Harvey, G. A., & Co. (London) Ltd. ... ...
Hick Hargreaves & Co. Ltd. ... ...
Hilmor Ltd. ... ...
Holman, Michell & Co. Ltd. ... ...
Holmes, W. C., & Co. Ltd. 101
Hopkinsons Ltd. ... ...
Horseley Bridge & Thomas Piggott Ltd. ...
Horstmann Gear Co. Ltd. 66
Hudswell Clarke & Co. Ltd. ... ...
Hughes, F. A., & Co. Ltd. ... ...
Humphreys & Glasgow Ltd. ... ...

I

I.C.I. Ltd. (Metals Division) ... ...
Ideal Boilers & Radiators Ltd. ... ...
Inertol Ltd. ... ...
Ingham, John, & Sons Ltd. ... ...

J

Jeavons, E. E., & Co. Ltd. ... ...
Jeavons Engineering Co. ... ...
Jenkins, W. J., & Co. Ltd. ... ...
Johnson, C. H., (Machinery) Ltd. 60
Joy-Sullivan Ltd. ... ...

K

Keay, E. C. & J., Ltd. ... ...
Keelavite Rotary Pumps & Motors Ltd. ...
Keir, J. L. & Co. Ltd. ... ...
Kings Patent Agency Ltd. 99
King, Walter, Ltd. 68, 99, 100
Kirkham, Hulett & Chandler Ltd. ... ...

L

Lafarge Aluminous Cement Co. Ltd. ... ...
Lamont, James H., & Co. Ltd. ... ...
Le Bas Tube Co. Ltd. ... ...
Lee, Howl & Co. Ltd. 64
Lincoln Electric Co. Ltd. ... ...
Lind, Peter, Ltd. ... ...
Lionweld Ltd. ... ...
Lythgoe, Adam, Ltd. 74

M

MacLellan, George, & Co. Ltd. ... ...
Macpherson, Donald, & Co. Ltd. ... ...
Magnetic Valve Co. Ltd. ... ...
Main, R. & A., Ltd 94, 95
Major Robinson & Co. Ltd. ... ...
McNeill, F., & Co. Ltd. ... ...
Meltham Silica Fire Brick Co. Ltd. ... ...
Metal & Pipeline Endurance Ltd. ... ...
Meters Ltd. ... ...
Metropolitan-Vickers Electrical Co. Ltd. ...
Midland Iron & Hardware Co. (Cradley Heath) Ltd. 68
Milne (Edinburgh) Ltd. ... ...
Mint, Birmingham Ltd. ... ...
Mitchell Engineering Ltd. ... ...
Mitchell, H., & Co. ... ...
Moler Products Ltd. ... ...
Monk, A., & Co. Ltd. 63

N

National Benzole Co. ... ...
Neville, J. C., Ltd. ... ...
New Conveyor Co. Ltd. ... ...
Newton Chambers & Co. Ltd. ... ...
Norwest Construction Co. Ltd. ... ...

O

Oxley Engineering Co. Ltd. ... ...

PAGE

P

Parkinson & Cowan (Gas Meters) Ltd. 76
Parkinson Stove Co. Ltd. ... ...
Pass, E., & Co. Ltd. 70
Peebles & Co. Ltd. ... ...
Perl Controls Ltd. 75
Plenty & Son Ltd. 62
Power-Gas Corporation Ltd. ... ... Cover IV
Press, William, & Son Ltd. ... ...
Pyrene Co., Ltd. ... ...

R

Radiant Heating Ltd. ... ...
Radiation Ltd. 90, 91
Rawlplug Co. Ltd. ... ...
Reavell & Co. Ltd. 68
Ride & Bell Ltd. ... ...
Roberts, R. E., & Sons Ltd. ... ...
Robinson, J. H., & Co. (Liverpool) Ltd. ... 69
Royston, Geo., & Sons Ltd. ... ...
Rozalex Ltd. 68

S

Salter, T. E., Ltd. ... ...
Saunders Valve Co. Ltd. ... ...
Sawyer, Geo. E., Ltd ... ...
Scientific & Projections Ltd. ... ...
Senior Economisers Ltd. ... ...
Shaw Petrie Ltd. ... ...
Shell Chemical Co. Ltd. ... ...
Siebe Gorman & Co. Ltd. ... ...
Siemens-Schuckert (Great Britain) Ltd. ...
Sigma Instrument Co. Ltd. ... ...
Simon, Richard, & Sons Ltd. ... ...
Smith & Nephew Ltd. ... ...
Smith Meters Ltd. ... ...
Smith, Thos., & Sons (Rodley) Ltd., ...
Spanner Boilers Ltd. ... ...
Spencer-Bonecourt Clarkson Ltd. ... ...
Speedwell Gear Co. ... ...
Sperryn & Co. Ltd. 55
Stanton Ironworks Co. Ltd. ... ...
Staveley Iron & Chemical Co. Ltd. 61
Stein, John G., & Co. Ltd. ... ...
Stewart & Gray Ltd. ... ...
Stewarts & Lloyds Ltd. ... ...
Stillite Products Ltd. ... ...
Stoves Ltd. 67
Strachan & Henshaw Ltd. ... ...
Stringer Bros. ... ...
Sugg, Wm., & Co. Ltd. ... ...
Sutcliffe Speakman & Co. Ltd. ... ...
Sutherland, A. G., Ltd. ... ...

T

T & T Works Ltd. ... ...
Tangyes Ltd. ... ...
Teddington Refrigeration Controls Ltd. ... 64
Thorp, Thomas, & Co. Ltd. ... ...
Tully Engineering Co. Ltd. ... ...
Turners Asbestos Cement Co. Ltd. ... ...

U

Underpressure Engineering Co. Ltd. ... ...
United Gas Industries Ltd. ... ...
United Kingdom Construction and Engineering Co. Ltd.

V

Vaughan, Edgar, & Co. Ltd. ... ...
Vauxhall Motors Ltd. ... ...
Visco Engineering Co. Ltd. ... ...

W

Wakelin, F. H., Ltd. 99
Walker Bros. Ltd. ... ...
Walker, C. & W., Ltd. ... ...
Walkers (Century Oils) Ltd. 102
Walkers and County Cars Ltd. ... ...
Waller, George, & Sons Ltd. 57
Walter King Ltd. 68, 99, 100
Ward, Thos. W., Ltd. ... ...
Weir, G. & J., Ltd. ... ...
Wellington Tube Works Ltd. ... ...
West's Gas Improvement Co. Ltd. ... Cover III
West's Piling & Construction Co. ... ...
Westwood & Wrights Ltd. ... ...
Whessoe Ltd. 59
Whitley Moran & Co. Ltd. 62
Whitlock Bros. Ltd. ... ...
Wilkes, A. H., & Co. Ltd. 70
Williamson, Cliff, Ltd. ... ...
Wilson, George, Gas Meters Ltd. ... ...
Winn & Coales Ltd. 72
Woodall-Duckham Construction Co. Ltd. Facing p. 86
Wood, Hugh, & Co. Ltd. ... ...

Y

Yorkshire Copper Works Ltd. ... ...

Z

Zinc Development Association ... ...

Agencies ... ...
Appointments Vacant 99, 100
Appointments Wanted ... ...
Books ... ...
Contracts Open ... ...
Educational ... ...
Fellowship ... ...
Miscellaneous ... ...
Patents 99
Plant &c. For Sale 99
Plant Wanted. ... ...
Publications ... ...
Public Notice ... ...

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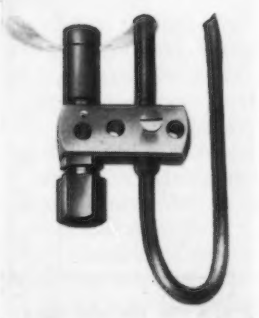

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Gas Journal

VOL. 291 *NO. 4904* *July 10, 1957*

109TH YEAR

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CONTENTS

Page

EDITORIAL COMMENT

Atomic Energy and the Gas Industry 77
Passing Shows 78
'Jet' Journey 78

NEWS OF CURRENT EVENTS

Personal 79
Diary 79
Two New H. & G. C.W.G. Plants are Opened at Proven .. 80
N.E.G.B. Develops 'Jet' Burners 81
Visit to Pilkington Bros. Ltd. Plant 82
Northern Juniors Hold Annual Meeting in Tynemouth .. 82
Scottish Gas Chief Deplores Lack of National Fuel Policy .. 83
But Strabane Gasworks Pays its Way 83
New Zealand Power Programme Will Cost £235 Million .. 83
Gas Industry Statistics 84
South Western Section Visit Plymouth 84
Midland Juniors Visit Staveley Company's Plant 84
Trade News 98

TECHNICAL RECORD

The Renovation of Works Plant To Meet Peak Demands. By W. E. Whitney 85
Preparation of a Distribution Development Report — Swansea. By A. Pickard 88
Gas Beats Prejudice Against Use for Heat Treatment of Light Metals in U.S. 96
Gas in France 97

PUBLISHERS' NOTICE, SEE PAGE 99

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Gas Journal

VOLUME 291. No. 4904. JULY 10, 1957. 109th YEAR

Atomic Energy and the Gas Industry

AT first sight it might seem that the energy to be derived from the fission of radio-active elements would only favour our competitors and have no application to our own industry. Indeed, one might almost imagine the electrical generating industry fostering the idea to highlight its own achievements in generating power without the use of fossil fuels, and to stress the out-of-date methods of gas production which our industry must perforce use because such modern means cannot be applied to the carbonisation process.

To see how specious this argument is, it is necessary to look a little more closely into the basic principles on which the generation of electric power by atomic energy rests. At its simplest it is no more than a means of raising steam without the burning of conventional fuels. The ordinary coal or oil burning furnace has been replaced by the hot coolant gases from a carefully controlled atomic pile. The steam so raised is then utilised in a conventional turbine to generate electricity at the usual low heat efficiencies associated with such processes in any coal or oil fired power station. The vast size of the components of these atomic energy 'fired' stations is necessary both for safety and economic running.

Why should not this source of heat be applied to the carbonisation of coal, a process which everyone knows is vastly more efficient thermally than the running of even the most efficient modern turbine? Why should not the gas industry be able to take advantage of an almost unlimited source of heat to carry out its process work instead of having prodigally to waste the none too plentiful fossil fuels in retort heating and other heat consuming processes on the gas works?

In the Financial Times Annual Review of Industry, published last week, Sir Charles Ellis, Scientific Adviser to the Gas Council, discusses how atomic energy may be applied to the gas industry in an article entitled 'Gas Industry Research.' As the industrial development of atomic energy stands at present the temperature applicable to the heat exchangers for raising the necessary steam in an atomic energy power station is only of the order of 400°C., a temperature which is clearly far too low to apply to a retort setting which normally works at a flue temperature of 1,300°C. or more. Some other gasification process therefore must be found or the input temperature from the atomic pile must be substantially raised. Both these approaches are being kept in view and the Atomic Energy Authority is carrying out research to make available heat inputs to process equipments at 800°C.

Experiments being undertaken in the research stations of the Gas Council on alternative ways of gas-making show that at temperatures around 800°C. processes now being brought to perfection will work satisfactorily and by employing atomic fission as a source of heat, the cost of gas production by these processes would be about as low as it possibly could be.

In a paper read at the Research Meeting of the Institution last November, Dr. F. J. Dent and his fellow workers described a means of making large volumes of a remarkably clean gas with all the suitable characteristics for use as town gas by the hydrogenation of oils under pressure at a temperature of 700°-900°C To provide the hydrogen for this process, it would appear to be necessary to use the partial combustion of oil by oxygen, and later to add to the available hydrogen by reforming the methane in the output gas by steam to carbon monoxide and hydrogen followed by more steam to carbon dioxide and more hydrogen. The Atomic Energy Authority is of the opinion that by a regenerative heat process now being developed, hydrogen and oxygen may be produced from water.

Should this process be developed and reasonably pure hydrogen be manufactured from the very cheapest raw material, water, the heat load for its manufacture would be of an economic size for the reactor, there would be no necessity to recycle the gases from the hydrogenation process, which is exothermic, and there would be no expenditure of fossil fuel for running the process since

all the process heat would be supplied by atomic energy sources working at the suitable temperature of about 800°C.

Up till now atomic energy has been exploited only by conversion of hot gases into steam for mechanical energy, but if this process for manufacturing oxygen and hydrogen can be perfected and used commercially, the atomic energy will have been converted into potential chemical energy. This is recognised as being a very great step forward in both the economic use of fossil fuels and the reduction in production costs of gaseous fuel in very large units.

It appears that steps are to be taken to substitute coal for oil in the hydrogenation process. If this can be done the coal will be only partially hydrogenated and the residue gasified by oxygen and steam ultimately to carbon dioxide. With the hydrogen and heat available this carbon dioxide may be converted to methane and become part of the resultant product. Since the hydrogen, oxygen, the steam and the power will be derived from atomic energy, the most complete use will be made of our fossil fuels with no expenditure of valuable carbon reserves to supply the necessary heat for the carrying out of the process.

Here indeed is a tremendous step forward in fuel economy and the most interesting application of the newest form of energy. As has been pointed out the present application of atomic energy to electrical generation is merely the upgrading of heat to electrical energy by conventional mechanical means. If the processes outlined by Sir Charles come to fruition and are capable of being used on a commercial scale in large units, a technical achievement of far higher order will have been accomplished.

The conversion of a complicated substance like coal or oil into simple, easily handled, and readily available gaseous hydrocarbon fuel will have been achieved without the expenditure of any of our indigeneous carbonaceous resources in the process. And a big step will have been taken towards the ideal of providing all our demands of heat energy by the combustion of gaseous fuels produced smokelessly and our power demands from electricity similarly produced. Coal will have taken its place as a fundamental source of chemical raw materials and need no longer be burned as a crude form of fuel.

Passing Shows

AN examination of the gas stand at agricultural shows this year reveals a trend towards domestic appliances and away from equipment likely to interest the farmer. While it is doubtless true that judged by the probable volume of business to be picked up this makes good sense, we cannot help pointing out that with the amount of integration taking place in various parts of the country a little agricultural business is not to be sniffed at. Gas has never made a great deal of headway against the enormously more versatile merits of electricity in this field, but we have never regarded the gas industry's efforts as being very inspired or likely to appeal to the farmer. It is only necessary to look at the startling growth of bottled gas in country areas to appreciate that there is plenty of scope.

One of our complaints is that when dairy equipment is displayed at a show, it is almost always set out in the form of isolated units. In terms of selling power there is all the difference between showing isolated equipment and showing the same equipment in its proper surroundings. We hope that in future displays we may see a model dairy with all the gas apparatus in its correct setting and sequence. There is, we think, need for every area board which exhibits at these shows to gather together a 'pool' of agricultural gas equipment, including a small prefabricated dairy, for ready assembly on the site. There is quite a good story in 'gas service from cow to consumer' showing at the one end the cow and at the other the bottle of milk in the consumers' gas refrigerator, with the intermediate stages covered by gas equipment in its proper sequence.

It would appear to us that the tendency to show full-scale grain and grass dryers in operation is on the decrease, but where they are used more attention might be given to changing the charge at proper intervals. Nothing gives a worse impression than for the farmer to test a sample of grass (as he will surely do) and find it so dry after the first few hours that it almost crumbles to powder in his hand. Again, the temperature in the greenhouses must be carefully watched lest in our desire to show 'live' appliances at work in natural settings we forget the outside temperature and shrivel the plants within. Far better an appliance not working at all than working badly. And while no useful purpose will be served by filling the gas incubator with even dummy eggs, the brooder will always be shown to better effect if it contains some live chicks.

'Jet' Journey

LACKING the glamour of certain other industries, it is necessary that the gas industry should lose no opportunity of bringing its merits and achievements to the notice of the public and of those influential sections of industry on which much of our future prosperity must depend. Television time and supplements in such papers as the *Financial Times* are of the greatest value, and such is the industry's machinery for coping with these matters that few opportunities at national level are missed. An example of another type of activity—the Press visit to publicise some particular aspect of industrial utilisation—is described elsewhere in this issue. A company of journalists were taken to Leeds to see the North Eastern Gas Board's development of high pressure 'jet' burners which appear likely to facilitate heat treatment early in the production line, taking up only a minimum of space. The story had the advantage of being brand new and of illustrating the very valuable and co-operative work of industrial gas engineers in this country, although whether this story was *large* enough to merit such full-scale treatment is perhaps open to doubt. The visit emphasised one point very clearly. Even though you are dealing with experienced and knowledgeable journalists it is unlikely that many will be experts on gas. Accordingly it is vital that the story be presented to them in the proper sequence and that prior to any visit to factory or workshop they should be given a clear idea of what it is all about and what they should look for. Given the right presentation of a story of genuine interest the response can be very gratifying. We hope it will be so in this case.

This is particularly important in a branch of the gas industry that is responsible for the entire rise in gas consumption over the last few years. It is quite remarkable the way in which gas has shown itself particularly adaptable to all problems of industrial heating where it must compete for place among other fuels which are considered superior by many until it has been proved otherwise. The industry depends on publicity to make certain that industrialists are fully aware of this, but the publicity must be efficiently handled and only the area boards can effectively do that.

Personal Notes

MR. G. J. B. COX has been appointed Deputy General Manager by the Scottish Gas Board. Other appointments are: MR. A. MACPHERSON, Accountant and Administrative Officer; MR. T. SMITH, Service and Sales Manager; MR. K. F. CAIRNS, Distributing Engineer; MR. F. B. COOPER, Stores, Purchasing and Transport Officer; MR. B. PRESTON, Personnel, Welfare, and Training Officer; MR. J. P. SCOTT, Production Engineer, Edinburgh; MR. J. D. CAMPBELL, Production Engineer, Falkirk; MR. J. CAMPBELL, Production Engineer, Borders; MR. W. A. M. STEWART, District Manager, Armadale and Falkirk; MR. R. COWIE, District Manager, Borders; MR. S. C. JOHNSTONE, Sub-Group Manager, Dumfries.

MR. H. E. CHANCELLOR is relinquishing his appointment as Regional Sales Manager in the North East and North West of England for Parkinson & Cowan Gas Meters. MR. STANLEY ARMITAGE will assume full responsibility for sales in that area, in addition to his present duties as Regional Sales Manager in the Midlands, Wales and West Country. Mr. Chancellor will continue to have an interest in his former territory, where he will work in close co-operation with Mr. Armitage.

MR. J. B. SCOTT has been appointed Manager, Finance Administration; MR. C. S. HADFIELD, Controller; MR. F. S. MCFADZEAN, Treasurer; and MR. B. E. BLAKELY, Deputy Treasurer, by the Shell Petroleum Co., Ltd. MR. J. G. VAN DEN BOSCH has been appointed Finance Manager and a Director of Shell Tankers, Ltd.

MR. PHILIP W. B. KING, Director and Northern Manager of Walter King, Ltd., publishers of 'GAS JOURNAL,' 'GAS SERVICE AND DOMESTIC COKE,' 'GAS JOURNAL' CALENDAR AND DIRECTORY, etc., has changed his address to 11, Tewit Well Road, Harrogate; telephone Harrogate 69212.

MR. E. F. THOMPSON has been appointed Manager of the Horden and Shotton by-product plants in South-East Durham of the Northern Gas Board.

Freedom of Choice

THE last 96 of the pre-war gas-lit Council houses in Brierley Hill, Birmingham, are being converted to electricity. All except one that is. The tenant, 70-year-old Mr. Charles Fletcher, has refused to have electricity.

'Don't think we are being unreasonable,' said Mr. Fletcher: 'It is just that we don't like electricity, and my wife is nervous about it.

'If they really want to improve these houses it would be much better if they put some hot water on,' he added.

The Council is sympathetic. It has decided to wire the house for electricity, but not to connect it up.

MR. T. H. CROMPTON, 43-year-old Stores Superintendent with No. 2 sub-area Merseyside and North Wales Electricity Board, has been appointed Divisional Stores and Purchasing Officer, Sheffield and Rotherham Division of the East Midlands Gas Board, from September 9.

MR. W. E. MORDICAI has retired from his post as Manager of the Bankfoot coke works and by-product plant at Crook, of the National Coal Board. He will be succeeded by MR. HARRY BLAIR.

MR. I. M. O. HUTCHISON, Joint Managing Director of the Balfour Group of Companies, is in North America on a short goodwill tour. His itinerary includes New York, Rochester, and Toronto.

MR. G. S. WEBSTER has been placed in charge of the Stoke-upon-Trent sub-office of The English Electric Company, where he will be responsible for the sale of all products. He succeeds MR. R. EDWARDS who has left the Company.

MR. B. W. BALLS has been appointed Technical Sales Manager, and MR. A. H. ISAAC, Manager, Sales Engineering Department, by Foxboro-Yoxall, Ltd.

Ideal Home Results

At the 1957 Ideal Home Exhibition the Gas Council sold appliances worth £57,812—an increase on last year's figure of more than £12,000. Total number of appliances sold was 1,458, compared with 1,084 at the 1956 exhibition.

Diary

July 12. — MIDLAND SECTION I.G.E. Summer Meeting. Visit to Stoke-on-Trent.

July 15.—EASTERN G.C.C.: Connaught Rooms, Great Queen Street, Kingsway, London, W.C.2. 2 p.m.

July 22.—WEST MIDLANDS G.C.C.: Committee Room, Gas Offices, Edmund Street, Birmingham 3, 2.30 p.m.

Change of Address

The Selson Machine Tool Co., Ltd., have moved to more extensive offices and showrooms at 41-45, Minerva Road, North Acton, London, N.W.10. Telephone: Elgar 4000 (6 lines); telegrams: Selsomachi, London, N.W.10.

GOLD WATCH MARKS 40 YEARS' SERVICE

Mr. R. Prince, left, Chief Engineer of the South Eastern Gas Board, receives a gold watch in recognition of 40 years' service in the industry from the Board's Deputy Chairman, Mr. R. H. Sandford Smith. Mr. Prince began his career at Tipton, Staffs. He was successively Engineer and Manager of the Heywood and of the Loughborough Corporation Gas Departments, and was then General Manager and Secretary of the Peterborough and later Engineer and General Manager of the Brighton, Hove and Worthing Gas Companies. He was appointed Chief Engineer to the Board on nationalisation.

Scottish Gas Board Development

TWO NEW H-G C.W.G. PLANTS ARE OPENED AT PROVAN

DUE to open today are two new carburetted water-gas plants just completed at Glasgow's Provan gasworks of the Scottish Gas Board. They were designed and built by Humphreys and Glasgow Ltd., which was founded 65 years ago with the main object of introducing the carburetted water-gas process into Europe from America.

The new installation consists of two identical units of Humphreys and Glasgow 'Labourless' C.W.G. plant in a new building in which space is left for one future unit. Each unit has a normal daily capacity of 4 mill. cu.ft. of 450 B.Th.U. gas. The new installation adjoins and supplements the existing Humphreys and Glasgow installation of three units each of 2.8 mill. cu.ft. per day capacity, making the total C.W.G. capacity some 16 mill. cu.ft. per day.

The Provan installation represents the latest fully automatic design of plant in which all heavy manual labour is eliminated and the duties of the man in charge are chiefly to control operation to obtain maximum efficiency. It comprises water sealed self clinkering generators with low pressure annular boilers.

Each generator is capable of treating approximately 70 tons per day of coke which is fed from the overhead storage bunkers to the generator through the gas sealing valves of the coke charging machine without stopping gas making. As the carbon in the coke is consumed the resultant ash and clinker is extracted continuously through the water seal in the ash pan by means of the revolving self cleaning grate and is discharged, quenched and dustless, into skips for disposal.

The purpose of the annular boiler surrounding the fuel bed is primarily to keep the generator wall relatively cool and prevent clinker sticking high up out of reach of the revolving grate. At the same time this boiler raises a useful amount of steam at about 30 lb. per sq. in. for process.

Steel Vessels

The carburetter and superheater are mild steel cylindrical vessels with insulating and refractory linings and filled with checker bricks.

The carburettors, of a special type designed for the use of heavy oil, are shown in Fig. 1. As can be seen, the carburettor is divided into two parts, an upper or air preheat zone, and a lower or carburetting zone. Both these sections are filled with chequer bricks and down the centre of the upper section passes the oil spray pipe, which is water cooled and protected by an insulated refractory sheet, and carries the heavy oil to the carburetting zone.

Since the heavy oil has a high Conradson carbon content, carbon will be deposited on the chequer work after carburetting, making it necessary to clean the vessel before it becomes completely blocked.

During the blow period, air will be admitted at the top of the air preheat zone to burn the carbon mónoxide in the blow gases and raise the temperature of this section of the carburettor. Between the end of the blow period and the beginning of the 'run' period air only is admitted to the carburettor. This is preheated in the top section and passes into the bottom section where is burns off the deposited carbon and raises the temperature of the chequer bricks to incandescence. The hot gases will pass on through the superheater to the waste heat boiler and so to the stack in the ordinary way.

Since the 'burning off' period is taken out of the 'run,' there will be a slight fall in the output from the plant when heavy oil is being used for carburetting. Whether heavy oil or gas oil is used will depend entirely on the economic conditions ruling at the time. The difference in price between heavy oil and gas oil must be considerable before the heavy oil is used since, although the gas oil may be more expensive, its lower Conradson carbon content ensures a much higher enrichment factor. Should the difference in price justify a change to heavy oil, however, this special type of carburettor makes it possible to take full advantage of it.

Carbon Burned Off

Though the plant is designed to carburet either gas-oil or heavy fuel oil, it will be used for the time being on gas-oil because of present price differentials.

The washer seal is a circular vessel containing water which is maintained at a constant level and into which the inlet pipe is dipped an inch or so. Gas can flow forward but not backward, and this vessel also serves to trap some of the tar and grit in the make gases. The tarry deposit is run off from time to time through the valve at the apex of the conical bottom.

The condenser is of the spiral multi-pass water tube type in which the gas flows horizontally through a spiral passage with numerous water passes. Waste blast gases pass through the horizontal fire tube waste heat boiler which is designed for a pressure of 165 lb. per sq. in. The gentle scouring action of the fine grits in the blast gases keeps the tubes clean indefinitely and the grits are trapped in the 'centriflovane' grit catcher before the waste gases are discharged to atmosphere.

The automatic cyclic operation is carried out by the Humphreys-Glasgow safety hydraulic operator, which operates all the valves including the coke charger in safe and proper sequence at predetermined intervals. If anything goes wrong it shuts itself down, brings all the valves to the safe position and sounds an alarm which draws the attention of the operator to the fault.

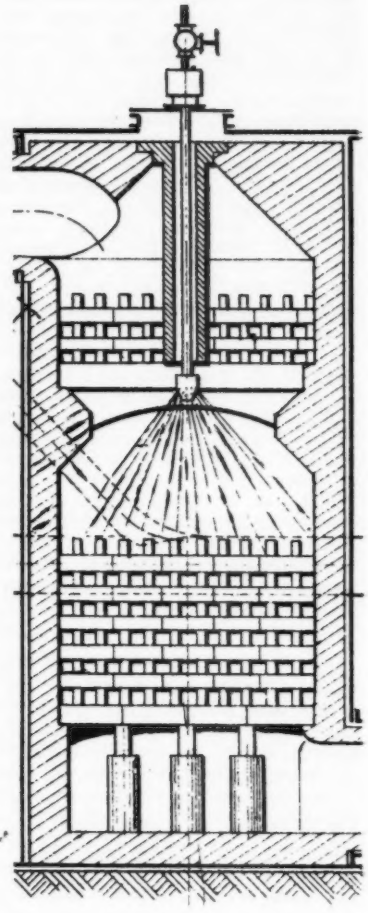

Fig 1.

Prior to 1939 with manually operated water gas units the operation was very hard work because, in addition to opening and shutting the working valves each six-minute cycle by hand—making 12 valve movements, some very heavy—it was also necessary to shut down every half-hour to charge coke and every four or five hours to dig out ash and clinker by hand from the base of the generator under very hard conditions of dust and heat. An added difficulty was caused by the rather large quantity of ash in the Scottish fuel which tended to fuse to the walls of refractory lined generators and could block the generator completely in a few days. The modern self-clinkering generator overcomes these problems.

Revolutionary High Pressure Heating

N.E.G.B. Develops 'Jet' Burners

THE introduction of high pressure 'jet' burners for selective heating of parts at speeds and temperatures never previously reached for such processes was the *raison d'être* of a Press visit to Leeds on June 28, sponsored jointly by the Gas Council and the North Eastern Gas Board.

The burners, which have been developed by Mr. R. H. Anderson, Industrial Development Engineer of the Board, and his staff, were demonstrated at the Bridge Street headquarters of the Board and were seen in operation at the Yorkshire Copper Works and at Clayton, Son & Co., Ltd. The visit concluded with a Press conference at the Queen's Hotel, Leeds, conducted by Dr. R. S. Edwards, Chairman of the Board.

High intensity heating has become a common feature in industry with the advent of electrical induction heating and by this method local heating of some complex structures is made possible by the high heat input rates employed per cu. ft. of material being treated. However, heavy capital expense and high running costs, coupled with technical difficulties involved in induction heating, have prevented its being adopted for many processes. Certain innovations now being developed in the gas industry, such as this pioneer work at Leeds, promise to revolutionise many processes where high intensity heating is demanded.

Heat Release

In the normal bunsen or neat gas flame type of burner, the rate of heat release is some .5 to 1.0 mill. B.Th.U. per cu.ft. of flame volume. This can be varied by modifications to burner design and the provision of pre-mix plant or air blast type burners enables this rate to be increased to some 2-3 mill. B.Th.U. per cu.ft. of flame volume. Recent work has, however, made it possible to increase this rate of heat release within refractory tunnels up to some 250 mill. B.Th.U. and a range of what are known as jet burners has been developed.

In this type of burner, combustion is completed very rapidly in a chamber or tunnel and the resultant gases, at temperatures of 1,750°C., are discharged from a narrow opening at the tunnel mouth at supersonic velocities. The combination of high temperature and velocity gives these burners their phenomenal heating potentials. With these burners, the need for surrounding the material to be heated with refractory structure to prevent heat loss can now be dispensed with and the economic heating of large structures has been made possible since conduction and radiant losses are insignificant in comparison to the high heat input rate.

Larger Consumer

During the party's visit to the Yorkshire Copper Works, which is the Board's largest gas consumer with a consumption for the year ended May, 1957, of nearly 480 mill. cu.ft., several types of furnace were inspected. These included the four gas-fired presshouse furnaces which together have a consumption of over 1½ mill. cu.ft. per week, and the walking beam furnace which consumes 500,000 cu.ft. weekly.

At Clayton's three types of gas utilisation were shown—an annealing and stress-relieving furnace, socketting fires, and roller welding or lap welding equipment. In the first, vessels or pipes up to 6 ft. in diameter and 28 ft. in length are heated in a furnace with an inside capacity of 6 ft. 9 in. diameter and 28 ft. 6 in. Temperatures up to 950°C. are controlled automatically from three points.

The burner consists of 24 jets, 12 on each side, arranged tangentially to the inner surface 12 jets on one-half of the furnace operate clockwise and the 12 jets in the other anti-clockwise. Only the jets covering the length of the tube are lit, the remainder not being used. The required temperature is set in the control cabin and when this is reached the air is automatically cut off and the gas reduced to about 5%. A tube 62 in. in diameter, ⅜ in. thick and 18 ft. in length is raised from cold to 650°C. in about 25 minutes, prior to hot-rolling. The furnace was designed by the Dowson Mason Gas Plant Company.

The roller welding or lap welding machine was designed originally for operation on water gas but, with the advent of the high pressure burners developed by the North Eastern Gas Board, it has been modified for use with town gas. The machine consists of an hydraulically operated carriage for moving tubes from 14 in. to 72 in. diameter and up to 26 ft. long; the hydraulic roller has a 12-ton load.

Cleaner Weld

Operating on an air pressure of 3 lb. per sq. in. and a gas pressure of 1½ lb. per sq. in., the burners are arranged one inside and one outside the tube; they are water cooled. Since the conversion results have been more economical, a cleaner weld has been obtained, and operators have stated their preference for the new method.

The socketting fires were designed jointly by the Gas Board and Clayton's. The larger fires take up to 72 in. diameter tubes and have four jets. Air is induced from a fan at about 25 lb. per sq. in. pressure and the gas and air pass through an ejector to the furnace.

The special display arranged by the North Eastern Gas Board in their Bridge Street, Leeds, premises to demonstrate the operation of their high pressure 'jet' burners. Among the exhibits is the pre-heating of valve bodies prior to metal deposition in which the required portion of a 2-ton valve body is heated to 750°C. in 12 minutes, a process which hitherto took six hours.

GAS PRICES MAY RISE IN ULSTER

Belfast Corporation Gas Committee has decided to hold a special meeting to consider the effect of the latest rise in coal costs on the price of gas. A substantial rise in the cost of gas to the consumer is likely. It may be 7d. per 1,000 cu.ft.

Mr. Alan Robin, Deputy Manager of the Gas Department, said the increase in coal prices would cost his Department an extra £75,000 a year. It was normal procedure, he said, to pass the increase on to the consumer.

Manchester Section, I.G.E.

VISIT TO PILKINGTON BROS., LTD., PLANT—CHAIRMAN'S WISH GRATIFIED

IN accordance with a wish expressed by the Chairman of the Manchester section of the Institution of Gas Engineers, Mr. R. L. Greaves, M.B.E., in his Chairman's address, Chairman's Day was made the occasion of a visit to the research laboratories, sheet works, and fibre glass works of Pilkington Bros., Ltd., of St. Helens, Lancs.

Luncheon was provided by the Chairman, Mr. D. P. Welman, and Members of the North Western Gas Board in the Town Hall. Among the guests were the Mayor, Councillor J. Henebery; Dr. J. Burns, G.M., President of the Institution of Gas Engineers; Sir Harry Pilkington; Mr. J. B. Watt; Sir Frederick West, K.B.E.; Sir Thomas Williamson, C.B.E., Chairman of the T.U.C.; Alderman J. Hughes, O.B.E.; Mr. W. Hodkinson, C.B.E.; Sir Thomas Williamson, C.B.E., the Section Hon. Secretary, Mr. J. Castle.

After the loyal toast, Mr. Welman proposed a toast to the County Borough of St. Helens and the guests, to which the Mayor replied. Dr. Burns proposed a toast to the Manchester Section, to which Mr. Greaves replied.

The Manchester District Institution of Gas Engineers, as it was then called, visited St. Helens in 1912 when Samuel Glover was the District President, Mr. Greaves recalled. The Manchester District Institution also visited St. Helens in 1909 when Mr. Morris, of Sheffield, was President. On that occasion they inspected the first installation of Glover-West continuous vertical retorts in the world.

After touring the works the visitors were guests of Pilkington Bros. at tea. Mr. Geoffrey Tilley expressed thanks to the hosts. The visit had been one of the Section's most notable occasions, he said. Seconding him, Mr. Alan Nicholson, Junior Vice-Chairman, said it was an impressive fact that total annual consumption of gas at the Pilkington works was 2,500 mill. cu.ft., the equivalent of the consumption of a town the size of Blackpool.

Mr. J. B. Watt, Director of the Company and a Member of the North West Gas Board, replied.

The Gas Fitter's Vital Role

THE most important rôle for the industry was to convince the public that they had a service second to none, said Mr. D. Beavis, General Manager of the Edinburgh and South-Eastern Division of the Scottish Gas Board recently. The ability to do that depended very largely on the gas fitter as he went about his job.

Mr. T. H. Smith, Service and Sales Superintendent, Edinburgh, presided. Mr. Cox, Deputy General Manager of the Edinburgh Division was also present.

I.C.I. £100 Mill. Project

Imperial Chemical Industries, Ltd., are seeking permission from Gloucestershire County Council to develop a 1,000-acres site on the Severn in the Thornbury Rural District for the manufacture of organic and inorganic chemicals. If permission is granted, the total amount invested in developing the site between now and the mid-1970's may well be of the order of £100 mill.

New Laboratories

The new research laboratories of Hardman and Holden were opened at Miles Platting, Manchester, last month. The Company is known throughout the gas industry for its work of chemical extraction from spent oxide.

NORTHERN JUNIORS HOLD ANNUAL MEETING

MEMBERS of the Northern Junior Gas Association attending the Annual General Meeting last month assembled at the Park Hotel, Tynemouth, where they were entertained to lunch by the Tyneside Division of the Northern Gas Board. After lunch the President, Mr. J. C. Graham, Newcastle, gave a special welcome to the Chairman, Mr. E. Crowther, the Deputy Chairman, Mr. J. E. White, and a Member—Councillor Allen, J.P.—of the Northern Gas Board. He also paid tribute to Mr. W. Sutcliffe, Divisional General Manager of the Tyneside Division, who had attended every meeting of the Association.

Meetings Important

Mr. E. Crowther, Chairman of the Northern Gas Board, in reply, expressed his pleasure at being with the Juniors. He attached great importance to these meetings and felt that if the Association had not existed, the Board would probably have had to create a platform for discussion at their own expense.

The gas industry, he said, was dependent for its technical development on its production, distribution, and consumer service engineers. Many changes had taken place recently and developments had been achieved in many directions. They were on the threshold of new developments, if only because they did not know how much longer they could rely on good coking coal at economic prices.

Could they foresee the use of the nuclear reactor to cause carbon and hydrogen to combine to produce gas without the expenditure of carbon to provide the heat of reaction? There were many possibilities to those who could keep an open mind and a lively imagination supported by a sound technological training.

In the afternoon the annual general meeting was held in the lounge of the hotel, when the president gave his address, in which he discussed the Redheugh works, on the south side of the River Tyne, and outlined developments which have taken place in recent years. Mr. H. Waiton, Howdon, proposed a vote of thanks.

Officers elected for the ensuing year were:—President, Mr. G. W. Robson, Newcastle; Senior Vice-President, Mr. R. S. Longhurst, Carlisle; Junior Vice-President, Mr. H. Waiton, Howdon; Honorary Secretary, Mr. R. Proud, West Hartlepool; Honorary Treasurer, Mr. C. H. Ling, Darlington; Honorary Transactions and Publicity Secretary, Mr. R. S. Longhurst, Carlisle. Members of Council, Mr. W. O. Kirkwood, Sunderland, Mr. G. E. Haddon, Stockton, Mr. L. Nelson, Blyth, and Mr. J. R. Matthew, Shotley Bridge; Northern District Education Committee, Mr. G. E. Haddon, Stockton, Mr. P. N. Lee, Middlesbrough, and A. Ruddick, Sunderland; Honorary Auditors, Mr. A. O. Old, West Hartlepool, and Mr. D. Yule, South Shields.

President Invested

The retiring President, Mr. J. C. Graham, then invested the new President, Mr. G. W. Robson, with the chain of office. Mr. Robson took the Chair and announced that Mr. F. W. Sawyer, Darlington, had been awarded the S.B.G.I. Silver Medal for his paper 'An Unusual Problem of Gum Formation.' He then presented the Certificate of Office to the retiring President, Mr. J. C. Graham, who expressed his appreciation of the support he had received during his year of office.

The meeting concluded when Mr. J. R. Matthews proposed a vote of thanks to the officers of the Association and Mr. R. Proud replied.

Scottish Gas Chief Deplores Lack of National Fuel Policy

THE whole picture of the situation involved in the Scottish Gas Board's struggle against the unfair competition of the electricity authorities was drawn by Sir Robert Nimmo, Perth, Chairman of the Scottish Gas Consultative Council, when he addressed the Central District Committee in Kinross recently.

Sir Robert said it was a pity the Government had not been able to formulate a national fuel policy designed to use our limited coal resources to the greatest financial advantage. A rational system of fuel usage was as much to the advantage of the community at large as to the private individual.

A combination of coke and gas for space and water heating, with electricity for lighting and household and industrial power would fulfil the requirements for such a pattern.

Those who imagined that all-electric communities were the answer had reached a decision contrary to the interests of the nation and the majority of householders. An all-electric housing scheme would mean the continuance of purchase tax or a general high level of taxation since large-scale electrical projects were financed by the Government whose only source of revenue was taxation.

If the electricity which was being increasingly manufactured was directed into industry, the same objections could not be made since the purpose of employing more electrical power in industry was to reduce the cost of manufactured goods and help our position in export markets. This could provide additional revenue to the country, to support further expansion of the electrical industry.

But there could be no financial advantage in trying to displace gas from domestic premises throughout the country.

There was a growing demand for coal for electrical generation which the Coal Board could not meet. It had been planned that the fuel gap should be bridged by increasing oil imports. Was it any wonder that the country, to avoid an electrical supply crisis, had been obliged to accept the recent situation in the Suez area?

Any increase in the output of the gas industry meant that coal was used to best advantage. The gas industry required a third of the capital investment of any coal-fired electrical generating station to produce the same heat or power, and used half the coal to produce it.

It would be to the national advantage to expand the gas industry much more rapidly than in the past few years because the gap between coal production and demand would be reduced and the strain on our capital investment programme lessened.

A reduction in the amount of oil imported would also follow. In addition, production of the 4,000 by-products of gas manufacture, many of them among our most remunerative exports, would be stepped up.

No Government could with equanimity allow a deterioration of the gas industry, and those who suggested it was finished had little appreciation of the true state of affairs.

Smoke Control Area

Leeds Corporation Health Committee has approved in principle the establishment of a smoke control area in the centre of Leeds. The plan, which is to serve as a basis for discussions with other bodies, involves an area of about 1,000 acres, including the Leeds General Infirmary, the University of Leeds and the new light industrial estate at Kirkstall.

BUT STRABANE GASWORKS PAYS ITS WAY

WHEN Mr. T. Boyle recommended to Strabane (Co. Tyrone) Urban Council that gas be made available to a number of newly built houses, Councillor W. Elliott said they would have to face up to the day when the gasworks would be no more. Cookstown and Enniskillen had had to close their gasworks, and that was the trend.

The Chairman, Councillor A. Vaughan, pointed out that the concerns in Cookstown and Enniskillen were privately owned. There was no question of any gasworks in Northern Ireland run by a local authority closing. Strabane gasworks was certainly a paying proposition at the moment.

The question of gas supplies for the new houses was adjourned.

N. Zealand Power Programme Will Cost £235 mill.

NEW ZEALAND'S biggest power development programme, costing £235 mill. over the next 13 years, has been announced in a recent Government report. It provides for geothermal, gas turbine, and hydro-electric power stations.

The report recommends approval in principle of a scheme for linking the North and South Island power systems by a submarine cable across Cork Strait at a cost of some £16 mill.

It estimates the cost of the huge Benmore hydro-electric power station to be built on the Wuitaki River in South Island as £36 mill. The station will produce 480,000 kW and will be the largest in the Southern Hemisphere. Preliminary work on the site had started and the station should be finished early in 1966.

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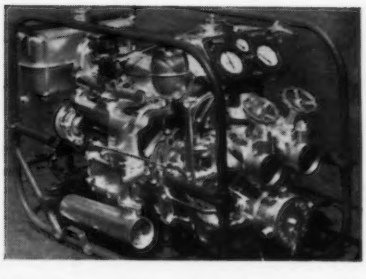
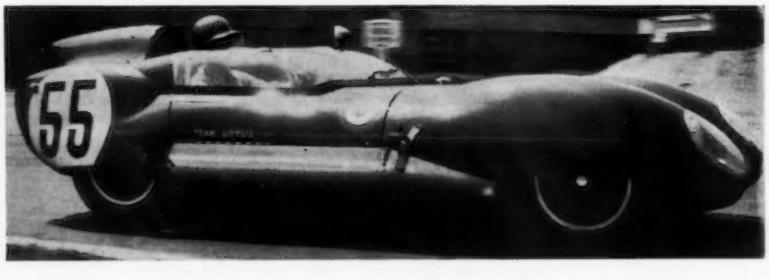




A familiar sight on the modern gasworks, the Coventry Climax lightweight portable fire pump pictured above, left, is operated by an engine which, with slight modifications, was used to power the Lotus racing car, right, which recently won the index of performance class back from France after 25 years. The pumps deliver 360 gal. of water a minute at 60 lb. per sq. in.

GAS INDUSTRY STATISTICS

Industrial Gas Sales Hold Steady, Domestic Consumption Down 1%

THROUGHOUT the year to March 31, appliance sales continued to be affected by hire-purchase restrictions. There was, however, some indication during the January-March quarter of a recovery in sales of cookers and water heaters.

Higher temperatures during the January-March quarter, caused a fall in the use of gas, especially by domestic consumers. Averaged over the year provisional figures indicate a fall of about 1% in domestic and commercial sales, and little change in the use of gas by industry, with total sales over the year 1% below the previous year's figures.

Gas available from January to March fell 9%. Provisional statistics indicate that sales of gas to industrial consumers were 0.4% up on the previous financial year, but domestic and commercial sales showed falls of 1%. The average realised value per therm of gas sold rose to 19.5d. per therm in the January to March quarter and averaged 19.1d. per therm in the financial year (17.7d. per therm in 1955-56).

Effects of Suez

As a result of the Suez crisis and of the weather the production of water gas in the January to March quarter 1957 was restricted to a half the production in the same quarter of 1956, and there was a cut in gas oil consumption to one-third of the quantity used a year ago.

In the year ended March, 1957, coal gas made fell by 0.8%, and coal carbonised by 0.7%. Water gas production fell 24% using 20% less coke and 32% less oil. As 12% more surplus gas was purchased from coke ovens and oil refineries, total gas available fell by less than 2%.

Six new oil gasification plants have been brought into production during 1956-57 and gas production from this type of plant increased by 16%.

Coke production fell 1% below production in the previous year for the January to March quarter, but was less than ½% down on the year. Sales, however, were 8% down and stocks rose by over 1 mill. tons during the year.

Crude tar production fell by 5% in the fourth quarter, but by only 1% in the financial year, and benzole production was 8% down in the fourth quarter, but 1% up in the financial year.

In the 12 months of the financial year sales by cash and hire-purchase of cookers fell by 10%, of gas fires by 17%, and of water heaters by 8%. Refrigerator sales were almost halved.

New gas-making capacity of 28 mill. cu.ft. was brought into use in the fourth quarter 1956-57. This made the total of new plant brought into use in the year up to 105 mill. cu.ft. compared with 104 mill. cu.ft. in 1955-56.

An increase of 458 miles in the length of new mains laid between January and March, 1957, brought total new mains laid during the 12 months ended March, 1957 up to 2,060 miles. This figure is less than that for the year 1955-56 by 17%.

The total number of employees in the gas industry at the end of March, 1957, was 2% less than the figure for the end of March, 1956.

Bigger Audiences

More than 8.5 mill. people saw Gas Council interest and instructional films during the year ended last March—a 30% increase in showings over the previous year.

MR. THERM BURNED TO SERVE HIM

BRIDLINGTON gasworks played good samaritan recently to a 7-year-old day visitor from Sheffield who fell into the sea and went to the information bureau to ask where he could dry his clothes.

They took him to the gasworks where his clothes were put to dry while he was given a good rub down. Within half an hour he was back playing happily on the sands.

MIDLAND JUNIORS VISIT STAVELEY COMPANY'S PLANT

LADIES' Day of the Midland Junior Gas Association featured a visit to the Staveley Iron and Chemical Co., Ltd., near Chesterfield. The party of over a hundred members and their ladies, lunched at Ringwood Hall, staff club of the Company, before going on a tour of the foundries, the pipe spinning plants, and the chemical installations of Devonshire Works.

At lunch they were officially welcomed by the Chairman and Managing Director, Mr. S. W. Martin, who was accompanied by two other members of the Board, Mr. A. E. Biggs, Secretary, and Mr. J. D. Berresford, Commercial Manager. Mr. J. A. W. Stretton, President of the Association, thanked the hosts for the arrangements made for Ladies' Day and commended the firm's family spirit.

Back at Ringwood Hall for tea, the President said how interesting and impressive, the visit had been. The foundries General Manager, Mr. E. Freer, responded for the Company.

New Headquarters

The raw materials division of George Cohen Sons & Co., Ltd., have moved their headquarters to 600, Wood Lane, Shepherds Bush, London, W.12. Telephone: Shepherds Bush 2070; telegrams: Coborn, London, telex No.: 22461. The Accounts Department will remain at Broadway Chambers, London, W.6.

SOUTH WESTERN SECTION VISIT PLYMOUTH

Members Spend 'Fishy' Afternoon and are Shown Drake's Drum

SOME 80 members and their wives visited Plymouth, when the South Western Section of the Institution of Gas Engineers held their annual summer meeting and ladies' day.

Mrs. J. W. Dean, wife of the President, welcomed the ladies at Radiant House and the company lunched at the Continental Hotel; after lunch Mr. Dean, who is also Divisional Manager, Plymouth, proposed the toast to the guests, and introduced Mr. N. G. Elliot, Plymouth City Water Engineer, and Mr. A. A. Cummins, Curator for Plymouth, who afterwards took members on a tour of Lopwell Dam and Buckland Abbey.

Replying to the toast, Mr. Elliot said he would like to hear members' views on how they would nationalise water, and complimented the South Western Gas Board on the way in which they had tackled nationalisation. The Vice-Chairman of the Section, Mr. T. L. Tallentire, of Cheltenham, thanked Mr. Elliot.

A feature of the visit to Lopwell Dam, which forms a major part of the Plymouth City waterworks, was the fishpass, a channel 10 ft. wide with removable steel partitions having a chamber built beneath it with three windows through which the fish can be seen swimming in their natural surroundings.

The party then proceeded to Burrator Lake, high level reservoir of Plymouth City waterworks, where Plymouth Corporation hold the annual 'Fyschinge Feaste,' in memory of the Sir Francis Drake.

On the return journey the visit to Buckland Abbey was made. Once the home of the Drake family and now a maritime and rural museum, Buckland Abbey was built by monks. Among many famous objects, it contains the original 'Drake's Drum.'

From a paper to the Wales and Monmouthshire Section, I.G.E.

The Renovation of Works Plant to Meet Peak Demands

By W. E. WHITNEY, M.Inst.Gas E.,
ASSISTANT GENERAL MANAGER AND ENGINEER, NEWPORT UNDERTAKING, WALES GAS BOARD.

AT the Crindau works in Newport coke oven gas is received from the Bedwas coke ovens at the rate of 2.5 mill. cu.ft. per day, and is purified in conventional iron oxide purifier installations. In addition, producer gas is generated to dilute the coke oven gas to the declared calorific value. The two producer plants are of the 'emergency' pattern used during the war and each has a capacity of 360,000 cu.ft. per day. For peak load purposes carburetted water gas is manufactured. This gas is treated in an electrostatic detarrer and passed through the main purifiers. The total volume of gas which had to be handled in 1956 was 4 mill. cu.ft. per day.

There are two holders at Crindau, with nominal capacities of one, and half a mill. cu.ft., respectively. Ancillary plant includes the main town boosters, the Caerleon booster, Lancashire boilers, and until recently, electricity for the works was generated by gas engine driven generators.

There are three sets of purifiers. The No. 1 set consists of boxes 20 ft. sq. with a total capacity of .75 mill. cu.ft. per day and was installed in 1885. The No. 2 set, each box of which is 20 ft. sq. has a capacity of 1 mill. cu.ft. per day and was installed in 1906. No. 3 set, installed in 1919, with 30 ft. sq. boxes, has a capacity of 2.25 mill. cu.ft. per day. All these purifiers are controlled by centre valves and consist of four main boxes with two catch boxes. No. 1 set had not been operated for 40 years.

C.W.G. Sets

There are two C.W.G. sets. A fully automatic set by Humphreys & Glasgow, Ltd., of 1.75 mill. cu.ft. per day capacity, was installed in 1949, and a semi-automatic set by Davison and Partner of 1.2 mill. cu.ft. per day was installed in 1943. This set, originally ordered for service in Calcutta, became available during the war, but has not been operated for nine years.

The two station meters are of the wet drum type. The No. 1 meter of 40,000 cu.ft. per hour capacity was installed in 1886 and the No. 2 meter of 60,000 cu.ft. per hour capacity was installed in 1908.

The holder capacity of the works consists of two column guided main storage holders and two small relief holders. The No. 1 holder, of .5 mill. cu.ft. capacity, was installed in 1885 and the No. 2 holder of 1 mill. cu.ft. capacity in 1893. Of the relief holders, No. 3 of 10,000 cu.ft. and No. 4 of 20,000 cu.ft. were installed in 1905 and 1949, respectively. Due to tilting and fouling between the side sheeting of the inner lift and grip plate it was not possible to utilise the full volume in No. 2 holder and 300,000 cu.ft. of the total capacity was ineffective. No. 3 relief holder was in a very poor condition and beyond repair.

There are four electrical generators with a nominal output of 150 kWh at 220 V. D.C., powered by gas engines varying in age from 37 to 50 years.

In order to improve the effectiveness of the station the following measures were planned:

(*a*) Recommission the Davison & Partner C.W.G. plant.
(*b*) Improve the performance of the Humphreys & Glasgow C.W.G. plant.
(*c*) Recommission No. 1 set purifiers and improve the efficiency of Nos. 2 and 3 set purifiers.
(*d*) Improve coke handling and stocking facilities.
(*e*) Replace the old generating plant with grid supplies.
(*f*) Fit a new station meter.
(*g*) Repair No. 2 holder.

The 10,000 cu.ft. relief holder of the Davison and Partner C.W.G. plant was beyond repair and we decided to use the 20,000 cu.ft. relief holder on the Humphreys & Glasgow unit for both plants. This involved laying an 18 in. diameter main with special connections, and the removal of the exhauster from a site on the Davison & Partner plant to the Humphreys & Glasgow power house.

This alteration had the additional advantages of eliminating maintenance on a separate relief holder and allowing the exhausters to act as standby units for either plant. It was planned to pass the production from both plants through the existing electrostatic detarrer on the Humphreys & Glasgow plant. This vessel had a capacity of 2 mill. cu.ft. per day, but we were assured by the makers that it would operate at an efficiency of 97% under the increased loading.

The main plant consists of two principal units. A generator with mechanical grate and jacket boiler, and a combined carburettor and superheater filled with chequer brickwork as shown in Fig. 1. The plant operates on an 'up' and 'down' run cycle and all valves are moved by a mechanical operator with electric drive. The blowers are driven by Greenwood and Batley steam turbines of 50 B.H.P., and the oil pumps are also steam driven. Charging of the generator is carried out by skip hoist, controlled manually, and at intervals of 40 minutes. The gas produced passes through a wash box and tubular condenser.

The Davison & Partner plant has a high steam consumption and the wast heat boiler on the Humphreys & Glasgow plant is not fully effective until the plant has been in operation for several hours. To overcome this and the heavy general steam demand on the works which has resulted in a shortage of steam at peak periods, an electric blower of 50 B.H.P. (originally used on the 'Jones' gas plant in 1940) was installed.

Our insurers were not prepared to give cover for the jacket boiler at the rated operating pressure of 100 lb. per sq. in. This was of welded construction and the particular design did not meet with their approval, so it was agreed to operate the boiler at 65 lb. per sq. in. The steam connections were re-arranged and a reduction valve fitted. The main blast inlet assembly, the skirt wearing plates on the mechanical grate, and all refractory brickwork were renewed. In addition, a general overhaul of valves, ancillary plant, and electrical equipment was carried out.

12-hour Tests

The plant was lit up on December 10 and raised to working temperatures in seven days. It was operated daily for short intervals over a three-week period. Several minor snags occurred, chiefly blockages in pipelines and adjustments to the mechanical operator and valve linkages. A number of 12-hour tests were then made and satisfactory results were obtained with gas production at the rate of 42,000 cu.ft. per hour.

The results obtained indicated a high rate of coke consumption per unit of gas made, and it was considered that this was due to the absence of a suitable creeper valve on the secondary air control. This resulted in a double wastage of heat. At the commencement of the blow the excess secondary air cooled the carburettor while excessive flaming at the stack occurred at the end of the blow period due to insufficient air to complete combustion of the increased volume of carbon monoxide in the blow gases. It has been decided to install creeper valve gear in readiness for next winter.

The opportunity was taken to operate the two water gas plants and producer plant simultaneously and it was found that the relief holder and exhausters could handle the large volumes quite readily.

Formerly the Humphreys & Glasgow plant was operated with a dense metallurgical coke of 2½ in. grading, the gas produced being 475 B.Th.U. per cu.ft. With this type of fuel, and continuous operation, the plant produced 1.5 mill. cu.ft. per day. It was decided to endeavour to increase the capacity of the plant by using a vertical retort coke and additional oil gasification. It was known that the porous texture and slightly higher calorific value of vertical retort coke ex Pontypool works would enable higher production figures to be attained. The manufacturers were consulted regarding additional oil gasification and an automatic steam valve was fitted to operate in conjunction with the main air blast valve. A small quantity of steam is admitted with the blast resulting in richer blow gases, and with the adjustment to the secondary air control enables a greater reserve of heat to be obtained in the fixing vessel. The makers stated that approximately 2.8 gal. of oil per 1,000 cu.ft. could be gasified by this method. In turn, this makes possible the full operation of the producer plant.

Encouraging Results

The effect of these changes was estimated to increase the daily output to 1.9 mill. cu.ft. after dilution to 475 c.v. with producer gas. In order to obtain the best results it is necessary to have several days continuous operation in order to obtain a 'soaked' heat in the carburettor and superheater. Unfortunately, the exceptionally mild winter weather, together with the recent restriction on the use of oil, have prevented us from carrying out period tests, but the initial results have been encouraging.

We were informed that suitable grades of vertical retort coke from the Pontypool works would be available only during the summer. Hence it was necessary to stock this fuel in quantity in readiness for the winter gas-making programme. The existing coke handling and storage facilities were extremely limited, the effective stock area held 350 tons of coke. 'Stelcon' wall units were installed, and this increased the storage capacity to 850 tons, equivalent to approximately three weeks' continuous plant operation. In order to recover the coke effectively, a coke conveyor with auxiliary hoppers was installed to handle coke from the stock yard to the base of the existing conveyor supplying the Humphreys & Glasgow plant. A 'Weatherill' hydraulic shovel was purchased to assist in the scheme.

The railway sidings were in a poor condition, and no major repairs had been made for 25 years. In view of the expected increase in traffic we carried out a complete overhaul, including relaying of 180 yards of track and resleepering a further 160 yards.

The H_2S content of the unpurified gas varies from 250-320 grains per 100 cu.ft.; despite this, it was known that the additional gas volumes would give considerable difficulty in our purifiers.

Nos. 2 and 3 purifiers were totally inadequate to handle the 5.5 mill. cu.ft. per day anticipated. It had been found that flows of 170,000 cu.ft. per hour were the absolute physical limit for this plant. In view of this we decided to recommission No. 1 set of purifiers.

These purifiers were originally wet lute vessels and had been converted to dry lutes. The lutes were filled with concrete, and channel sections with rubber sealing material had been fitted to the covers. The control of flow was by means of an early type of centre valve which allowed three boxes, and two catch boxes to be operated in series. The purifiers were mounted on brick piers installed in a pit 6 ft. in depth.

An examination revealed that corrosion had been active, and at points of local corrosion over 100 holes were found in the ¼ in. thick base plates. Patches were fitted on the exterior of the base plates, and the base of each purifier was covered internally with 2 in. of concrete slurry. The drain and seal arrangements for the centre valve and connecting mains were completely blocked, and a new system was fitted. The operating faces of the centre valve were badly corroded and pitted. The estimated cost of cutting the 18 in. dia. purifier connections and transferring the valve to the manufacturers for re-machining was £2,200 with completion six months from date of commencement. A local firm of engineers was invited to quote a ceiling price for machining the valve *in situ*. This work was carried out with the use of machining equipment specially constructed for the purpose and driven by compressed air. A 'blue' test and lead impression test gave satisfactory results. A saving of £1,000 was made by this method. The work, including the construction of the machine, was completed in three months. We considered installing a new set of connections with control valves to each purifier but the high capital cost involved led to our decision to repair the existing valve.

In December the preliminary work was completed and the purifiers were tested under air pressure. It was found that considerable leakage was occurring from the old wet lutes. This was due to shrinkage of the concrete filling. The top 1 in. of concrete was chipped away and molten bitumen was distributed over the entire sealing surface. A subsequent air pressure test of 20 in. w.g. revealed only minor leakages; these were made good, and the set was purged and put into operation in late December.

In order to improve the effectiveness of the other sets of purifiers, an active type of chemically prepared oxide was substituted for bog ore and individual steam supplies were fitted to the purifiers in the No. 2 set (No. 3 set was already so equipped). This was of particular importance because the gas compressed from Bedwas coke ovens had more than 20°F. of dryness. Individual air supplies were fitted to the purifiers in Nos. 2 and 3 sets, since previously the air had been admitted to the common inlet main to all purifiers and its effective distribution was doubtful. In addition we have been investigating various methods of insulating the covers of No. 3 set purifiers which are situated on an open site.

As a result of these improvements and additions we have successfully handled and purified flows of 220,000 cu.ft. per hour and daily gas flows of 4.5 mill. cu.ft. Previously a load of 4 mill. cu.ft. per day caused considerable difficulties.

The two station meters are rated at 100.000 cu.ft. per hour and for many years have been overloaded. The maximum safe overload is 80% and with the gas flows given above it has been necessary to by-pass the meters. An order has been placed for a Connersville meter of 6 mill. cu.ft. per day capacity but due to capital restrictions it will not be installed until mid-1957. As a reflection on relative efficiencies the new meter will occupy only 10% of the space now used by the old meters.

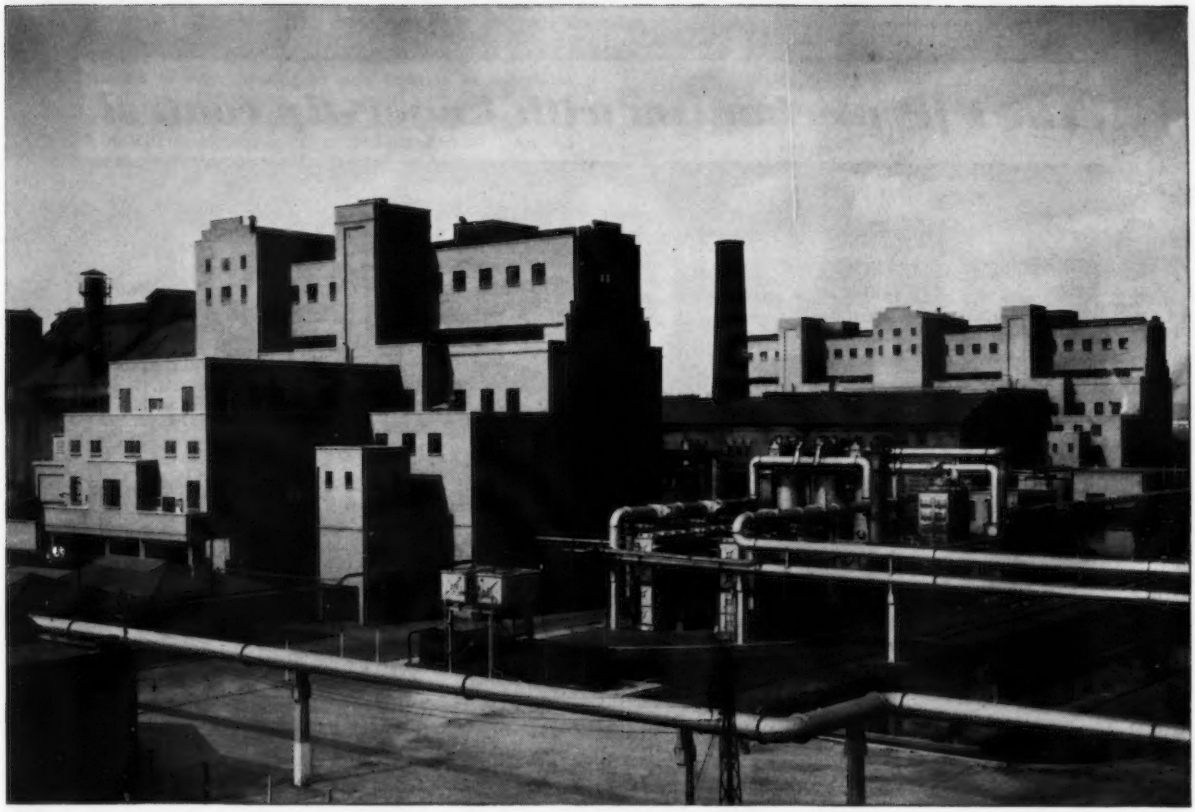
The whole of the works electrical equipment is 220 V. D.C. and formerly electricity was supplied with gas engine driven generators. Due to the age of these machines we had great difficulty in obtaining spares. Also the operating costs were excessive, at approximately 4.3d. per unit. In addition to economic considerations the plant was very unreliable, and at times it was necessary to restrict the load on the C.W.G. blowers resulting in lower gas production. These considerations led to the installation in November, 1956, of grid supplies at 415 V. A.C.

New Method to Save Money

A transformer unit and single-anode mercury arc rectifiers were installed. The output of this equipment is 500 amps at 220 V. D.C. and is designed to operate at 25% overload for two hours and a 100% overload for 15 seconds. We have found that this installation is ample for our requirements. The highest loading to date being 530 amps for a duration of three minutes. Our total potential load with every motor in use is 210 kWh., but many motors operate non-vital plant and the diversity of use allows for the smaller rectifier installation. We have fitted an A.C. supply which will be extended when new plant units are installed. We anticipate that the new method of electricity supply will save over £2,000 per annum, plus the added advantages of increased plant capacity and reliability.

The No. 2 holder had a considerable tilt when operated in the lower lift, and at a level of 0.3 mill. cu.ft. the side sheeting of the inner lift fouled the grip plate along a length of 12 ft. The clearances between the lifts were quite small along a similar length on either side of this section. It was considered unwise to operate the holder beyond the point mentioned, and thus a third of the capacity was ineffective.

A full discussion was held with the Mechanical Engineer to consider methods of investigation and repairs and it was decided to enter the holder under air pressure to effect repairs from rafts within the holder. This policy was adopted because of the limited storage capacity at Newport and the necessity to complete the operations by early October. It was estimated that it would take over five weeks to empty and refill the tank. Since the masonry tank is situated quite near to a similar tank on No. 1 holder and there is a high railway embankment butting on the west side of the tank, we felt that



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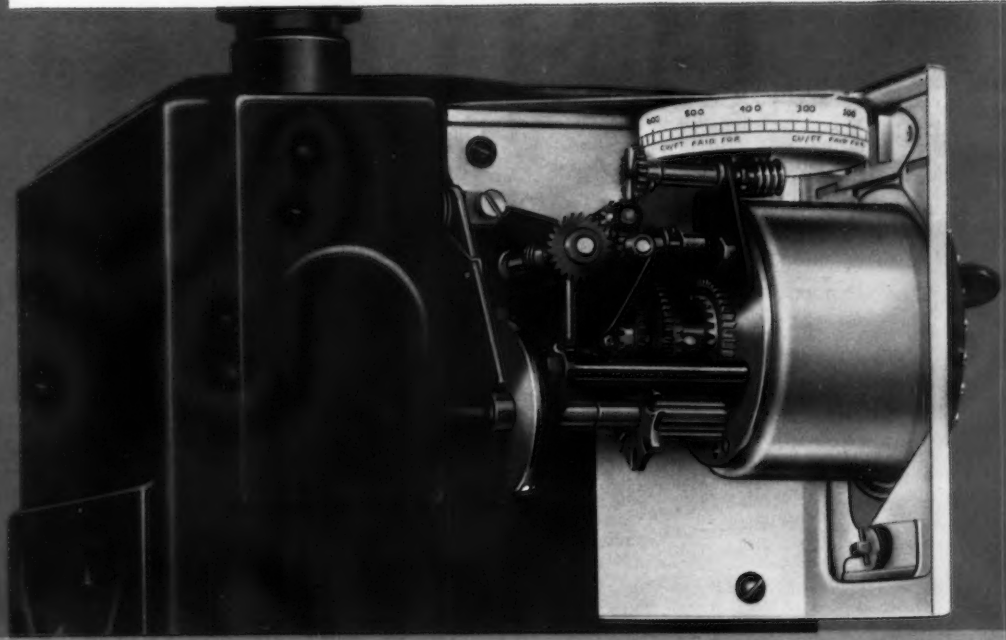

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the thrust set up by these forces when the water was withdrawn would lead to a collapse of the tank walls.

The holder was carefully deflated in the presence of the Insurance Inspector. No noticeable pressure variation occurred despite fouling of rivet heads and side sheeting at the point mentioned above. The holder was purged with the aid of a 10,000 cu.ft. per hour purging machine burning diesel oil. The inlet and outlet connections were cut and blanked off. An old 200,000 cu.ft. per hour electrically-driven gas booster was connected to the holder outlet main and used as an air blower. Air was blown through the crown for 48 hours in order to clear the purge gases. A flanged manhole 2 ft. in diameter was welded to the crown of the holder and an air-box with the usual sealing doors was bolted to the flange. A sectional raft was constructed and inserted through holes cut in the holder crown. The holes were then made good. The holder was progressively inflated under air pressure, and ladders were secured to brackets welded to the internal vertical stays. Electric light was provided by installing within the holder two arc lamps. Meanwhile the carriages on the inner lift were overhauled and adjusted. When this preliminary work had been completed an examination of the holder interior was carried out.

The general condition of the platework was excellent, apart from the second row of plates on the west side where corrosion had occurred. In the final stages of the work 30 patches were welded in this area, the largest being 10 sq. ft. in size. The cup rollers were examined and found to be in good condition.

Ten of the vertical stays on the outer lift were found to be 'bowed.' In the worst cases the bowing amounted to a 3 in. deflection at the centre of the stays. These stays were grouped diametrically opposite to the section where fouling of the lifts had occurred. The stays were removed by cutting pieces from the curved grip channel and drawing them out by means of overhead lifting tackle. Temporary supports were welded to the grip carriages and column guides in order to prevent sagging of the outer lift. The stays were taken to the Cardiff workshop for straightening, they were then returned and refitted. This operation took three days to complete. The holder was inflated and deflated under air pressure, and it was found that the tilting had been removed, and apart from slight rubbing of rivet heads there was a clearance between the inner lift side sheeting and grip. The side sheeting had a bulge of 1½ in. at this point and it was tacked to the vertical stays by means of bolts and a steel plate. This gave a positive clearance.

During the progress of these repairs, silt was found on the tank bottom facing the railway embankment. Tradition held that this was the prime reason for the difficulties originally encountered. In order to complete the investigations a diver was employed from Underwater Welders and Repairers, Ltd., of Cardiff, and an examination of the tank bottom was carried out on September 27. It was found that the rest blocks were 2 ft. 6 in. in height, proving that the slit on the tank bottom was not likely to have a serious effect. A small amount of silt was found on a few of the rest blocks but this was not in sufficient quantity to be harmful to the operation of the holder. (Subsequent levels taken at each column position with the outer lift grounded show a maximum variation of 1½ in.). While the diver was in the tank an opportunity was taken to examine the tank guide channels which were found to be in a satisfactory condition.

We had no available information regarding the nature of the 'dumpling' in the tank. The only drawings available were of a preliminary nature and indicated a flat bottom. The diver reported that there was in fact a 'dumpling' in the tank which commenced approximately 6 ft. from the tank wall, and there was no obvious breakdown of the dumpling surface. The diver completed his investigations in a day, and the cost to the Board was £50. We felt this was a worthwhile investment.

The holder was purged and charged with gas on October 7, the repairs having taken 76 days to complete.

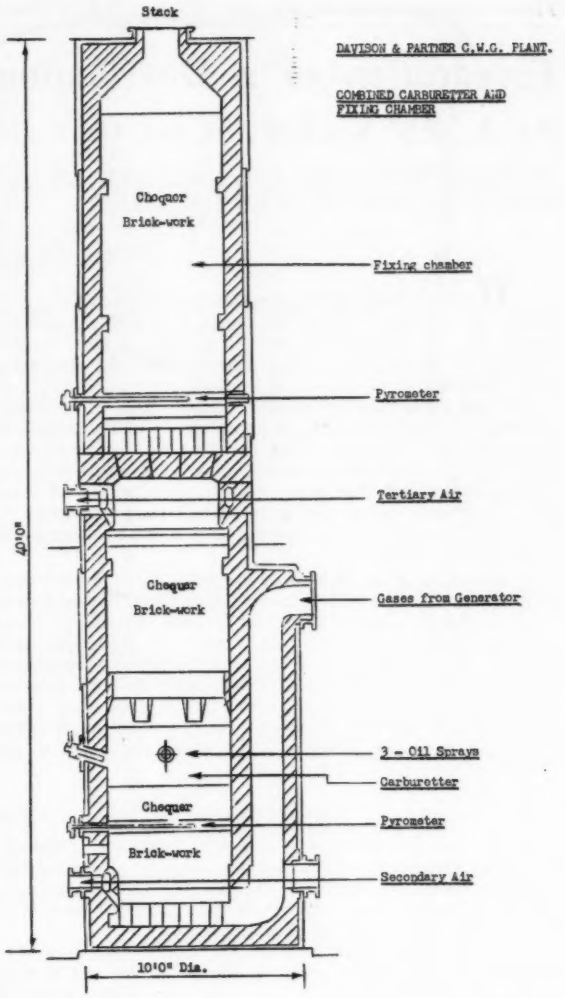


Fig. 1

DISCUSSION

In the discussion which followed, Mr. Whitney, replying to **Mr. K. Tiddy,** said a number of methods of insulating the purifier covers had been studied, among them fibre glass, the cost of which was rather high, and cork. This latter method with cork slabs set in molten bitumen worked out at about 6s. per sq. ft. and seemed to be most successful. They only aimed at a medium temperature of 80°C. in the vessels and found at a medium temperature of 80°F. in the vessels and found that a thickness of about 1 in. was adequate.

Mr. J. L. Wright said the covers should be removable for the summer. He asked about the capacities of the purifiers and whether three catch boxes were necessary at Newport, where, with a low hydrogen sulphide content of the order of 300 grains, the problem was one of back pressure rather than sulphide removal. He asked what standby plant for electricity supplies were available and touched on C.W.G. and boiler house labour problems. 'Could we not take more advantage of the fact that modern water gas plants are more or less automatic? ' he asked, and added, 'could we not use our technical assistants and use less skilled labour for watching the wheels go round? '

In his reply, Mr. Whitney said removable insulation had been considered but no firm decision had yet been made. Three catch boxes were essential with the old equipment at Newport, because there was a tendency for purified gas to slip in small quantities. As far as electrical supplies were concerned they were keeping two gas engined generators as standbys. In common with everybody else, they found extreme difficulty in obtaining works technical staff.

Mr. Wright proposed a vote of thanks to Mr. Whitney, which was seconded by **Mr. David Muir.**

From a paper to the Wales and Monmouthshire District Section, I.G.E.

Preparation of a Distribution Development Report—Swansea

By A. PICKARD, M. Inst. Gas E., M.I.I.A.

GENERAL MANAGER AND ENGINEER, SWANSEA AND PONTARDULAIS, GROUP CHAIRMAN, SWANSEA GROUP

WHEN I took over control of the Swansea gas undertaking on January 1, 1954, coal gas and C.W.G. making (except for the intermittent emergencies) had already ceased with the advent of grid gas. Distribution therefore demanded most attention.

War-time limitations and economic factors prior to nationalisation, had impeded progress in modification of the system at the source, i.e., outwards from the two distribution centres, Morriston and Oystermouth Road. Nearly all post-war house building had taken place in the outer sections of the Borough area. Terminal mains had consequently been extended, to feed these housing estates, without any notable enlargement of the feeder mains.

An exception to this was when in 1948 a 12 in. branch was taken from the 12 in. H.P. main (feeding our Oystermouth Road distribution centre from our Morriston grid receiving and distribution centre) about midway along its length, and laid for some three miles from Landore to Fforestfach to supply a new trading estate. This passed through two of the Council estates (Penlan and Cadle) and soon after nationalisation tappings from this H.P. branch main were taken and connected through district governors to the estate mains.

Augmented

In this way the gas supply was well augmented although the supply mains were not themselves enlarged. Similarly the supply to the trading estate was controlled by district governor, and the terminal of the estate main was connected back into the terminal of the general district mains.

There was, however, at the end of a short branch from the terminal of the district mains a large factory which was having trouble with its gas supply, which was vitally essential to its production. District main valves had therefore been operated in order to direct any surplus from the trading estate to this factory, thus depriving the locality of much of the benefit which it might have had as a result of the link.

Another factor of great importance was that during the war an area half a mile square in the very town centre had been completely demolished in air-raids and it was not until 1950-51 that the Borough's plans for a completely new town centre began to be augmented. This locality is very near Oystermouth Road distribution centre and some of our feeder mains are consequently involved including the H.P. feed to Oystermouth from Morriston; some existing mains will have to be extinguished before the Borough or its lessees can erect some of the planned new buildings, and new mains will have to be laid along some roads which do not at present exist, as and when the buildings now standing there are demolished and the new roads made.

This work has been sectionalised by the Borough for purposes of finance etc., with a new section being dealt with every second or third year so that our modifications in this district can only proceed in line with the Borough's plans. Our difficulties, however, are somewhat accentuated in that the new mains system has to be laid back from the town centre towards Oystermouth Road works rather than outwards from our works to the town centre.

Those of you who know Swansea and its environs, must also know of the beauty and popularity of the Mumbles, Langland Bay, Newton and Caswell districts. From the little fishing village of Oystermouth of a century ago it has now developed to an extensive community of residential properties. The sole gas supply, however, was still by means of 4½ miles of 10 in. diameter C.I. main laid in 1877.

Over the years boosted pressure had been built up, higher and still higher; two district governors had been fitted below ground, one 10 in. at the Dunns to supply Mumbles and Oystermouth Village, the other 6 in. in Newton Road to supply Newton and Langland; but despite the high boosted outlet pressures supplies at peak periods were far from satisfactory. This had no doubt been aggravated by the fact that in the intervening years, several branches had been taken from this supply to districts en route:—

Ashleigh Road—6 in. governor (2½ miles from Oystermouth Road works).

Mayals—6 in. governor (3 miles. Now also serves two private building estates in course of development).

West Cross, post-war Housing Estate—12 in. governor (this is a very extensive housing estate with a school, shops, etc.).

West Cross, old village—6 in. governor (3¼ miles).

So that even with lunch-time pressures of 42 in. W.G. (50 in. when distributing a high proportion of C.W.G. in times of emergency) ex works outlet, the initial 2½ miles of 10 in. M.P. main was being well taxed.

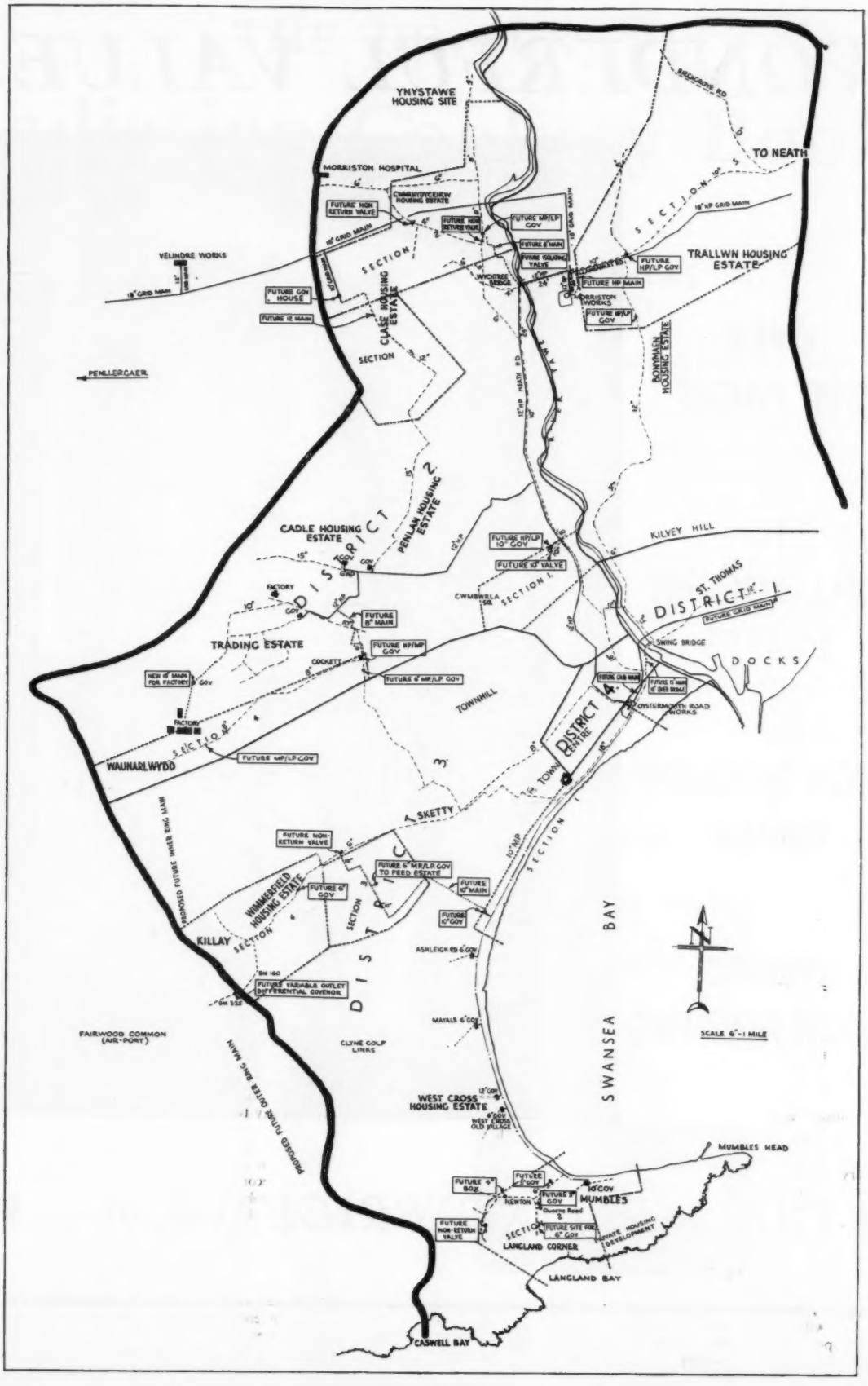
Another trouble spot was Waunarlwydd village at the furthest point of which was a very large and well-known metal works. This village is situated on the extreme north western borough boundary adjacent to the village of Gowerton and the gas supply is by means of an 8 in. diameter main which passes within the roadway crossing some 2 miles of common. Unfortunately, when it was laid in 1915, it was only taken out of a 6 in. main near Cockett station and the factory, which used the gas for canteen catering and process work was not satisfied, nor was the village supply sufficient.

The position was such in this case that following investigations it was decided to adopt an expedient (without waiting for the major report). We daily opened the trading estate terminal valve connection into the district mains at times of peak period until such time as an 8 in. H.P. supply from the approach to the trading estate could be run through Ravenhill Park, across the main Carmarthen Road, over private property to Cockett station to feed into the district mains system, via a district governor at the point of the 8 in. branch connection for Waunarlwydd. This main was put in hand, laid and in operation in December, 1954, and resulted in an almost straight line pressure chart measurement at the Waunarlwydd terminal, despite heavier consumptions both by the factory and the domestic consumers.

Two Supplies

Then there was the east side of the tidal river Tawe. At the southern end, known locally as the St. Thomas district, there were originally two supplies, one 6 in. diameter and one 12 in., both laid in the river bed. It was found, however, that the 6 in. had been cut off at the approaches to both sides of the river in 1936 when the main began to leak; furthermore, it was recorded that the 12 in. main had been laid in 1884, and a syphon on the west side of the river was recorded as having been bared and examined and found in perfect order some five years later. This 12 in. main is now the only supply to the eastern side of the river at the southern end, and the only link with the northern end is 1,500 yards of 6 in. and 800 yards 4 in. main, connecting back to the 12 in. in Jersey Road, referred to in the next paragraph.

At the northern end of this east side section a 10 in. low-pressure main passes along Llansamlet Road from Morriston gasworks gate to Llansamlet Square and continues 10 in. diameter up the Neath Road to the Neath boundary; but it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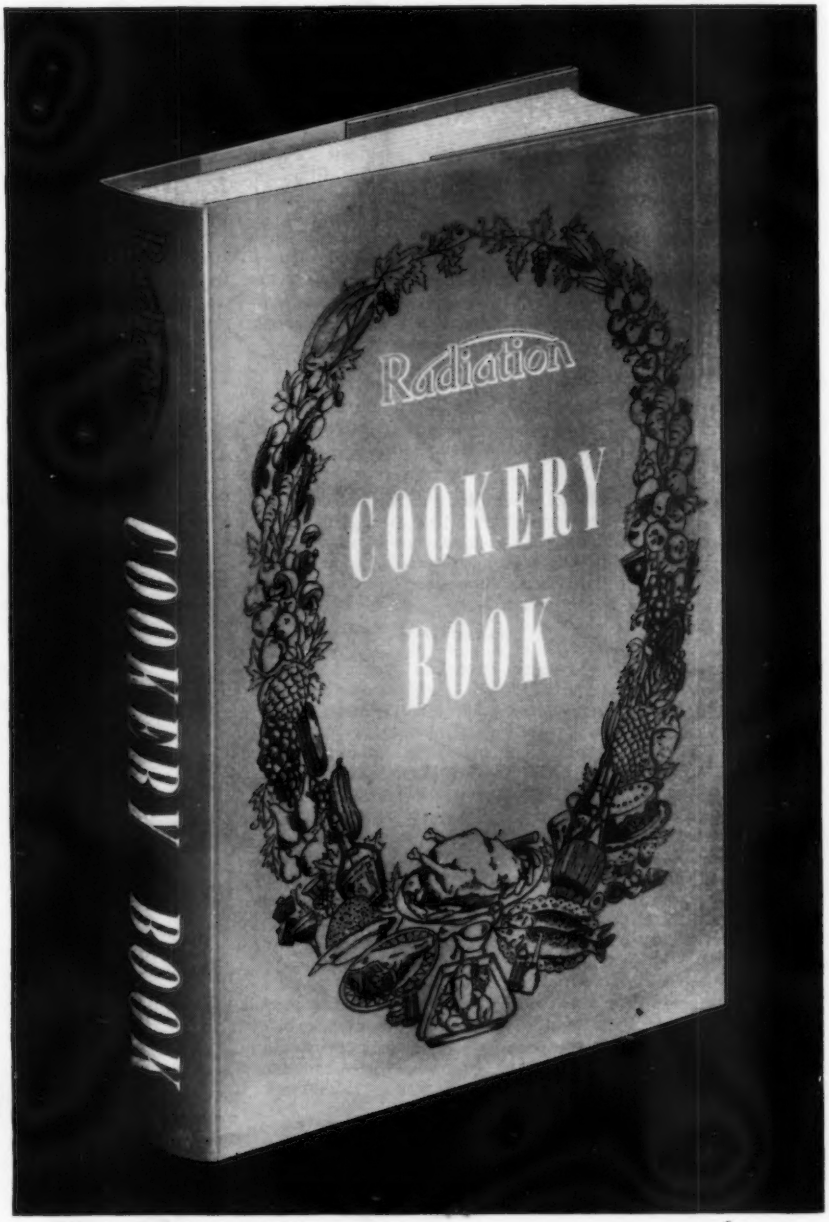

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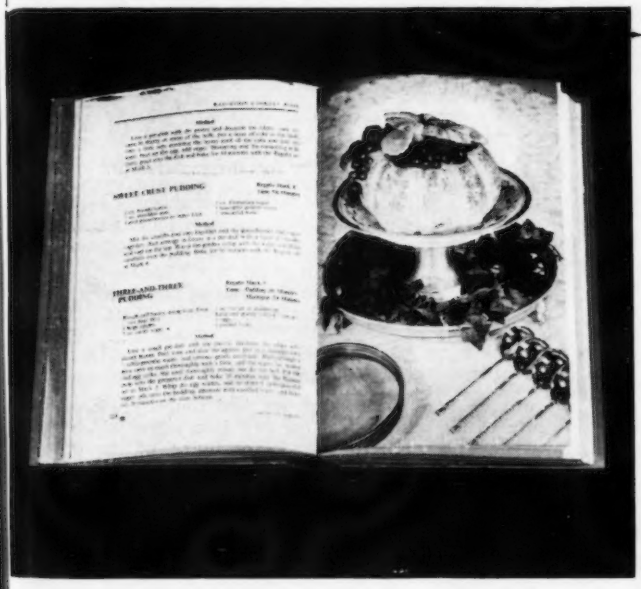

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also feeds from Llansamlet Square a 12 in. main along Nantyffin Road which continues along Jersey Road to link with the 6 in. referred to at the end of the previous paragraph, an 8 in. from the Square running towards Birchgrove, and an 8 in. main out of the 10 in. near the Neath boundary running back towards Birchgrove.

Both Bonymaen and Trallwn housing sites are situated within this district and further housing developments are envisaged. These then were some, but by no means all, of our particular difficulties.

The problem then was to find ways and means not only of making good deficiencies, but also to so modify the system as to make it sufficiently flexible to be adaptable to meet increasing demands and future potentials for domestic, industrial and commercial purposes without extravagance or unnecessary expense. What factors were then most necessary to enable us to do this?

Calculations of maximum hour consumptions, flows, pressure losses, etc., were, of course, basic necessities, and the usual daily and weekly pressure records at terminals were continuously available. Incidentally the heavy frosty weather from late January to the end of February, 1954, and to a lesser extent in 1955 gave us much practical evidence of the danger spots within a few days of assuming responsibility.

Mains

I have earlier mentioned the age of certain mains; were they in good condition, or bad? It was necessary to find out. In the case of the Mumbles Road main laid in 1877, of the three run-lead joints examined all three were leaking at normal lunch time pressures; but when we cut test discs from the main and had them examined by local experts the report was that "after microscopic examination and impact tests the characteristics shown were of a normal grey cast iron." We later found that for practically its full length the main was laid in sand and so far as thickness, strength and quality is concerned, it was in extremely good condition, with no sign of either internal or external corrosion. Many old records had to be traced and examined in the light of practical information available to us.

It was known to us that the Swansea Borough Development Plan although not in its final form was extremely well advanced in preparation.

Among other things, such information included the re-location of industries and possible levelling of waste sites for both industrial and housing developments also the movement of population within the boundary and their actual increases over past years upon which estimates for the next 20 years were based. We have to keep in mind, however, that revisions of the Borough development plan at intervals of not less than every five years are anticipated.

Having secured as much information as possible from past and current records, pressure charts, etc., the numbers of existing consumers in particular localities, the general impression as to the probable movement of population, the estimation of potential consumers and the estimation of ultimate loads it was now necessary to consider the various possible solutions.

Without going into too much detail, it had, by that time become generally accepted throughout the industry that whereas in pre-war days it was, in the majority of cases, more economical in the long run to use relatively large diameter mains and low pressures, the increases in costs of labour, materials and reinstatement had been so great that the policy was now reversed and it is more economical to utilise higher pressures and smaller sized mains.

As Morriston was a completely new works which only commenced gas-making in 1924, there was no immediate problem there so far as main sizes were concerned. The low pressure outlet from the works was a 24 in. main, reducing to an 18 in. on the Neath Road and continuing right back to Oystermouth Road in 18 in. (Landore). In addition there was the 12 in. high pressure feed from Morriston to Oystermouth Road to which previous reference has been made.

At Oystermouth Road, however, which has been in operation since 1861, there were already four main feeds running into and along the main road outside the works. These were: One 18 in. diameter main to Landore, one 18 in. diameter main to Town East, one 18 in. diameter main to Town West and one 10 in. M.P. main to Mumbles and Langland and beyond.

When the 24 in. Morriston main was connected to the 18 in. Landore main, the Landore governor was put out of commission and the load taken from Morriston; the 18 in. main still remains and we propose to put it back into operation. The Landore governor was still out of commission. The possibility of taking new and additional mains out of the works was complicated by the fact that the Borough Council propose to widen this road, taking in some of our works land in order to do so, although the road line has not been exactly determined.

Having given due weight to all the many factors involved it was decided that the modifications of existing mains to enable them to carry higher presusres would be the most practical, effective and the least costly means of meeting the position as we saw it. In arriving at this decision we were influenced by the following facts:

(*a*) We already had 8 miles of main within our own system capable of carrying pressures up to 25/30 lb. per sq. in.

(*b*) a direct 10 in. H.P. grid supply into the northern section of our system, some 2 miles west of Morriston via the district governor, had already been agreed between the grid and my predecessor;

(*c*) the principle of a direct grid supply from Briton Ferry into our Oystermouth Road centre was part of the grid future plan.

Thus when item (c) is implemented the existing 12 in. H.P. main between Morriston and Oystermouth Road would (except in case of emergencies) be available entirely for augmenting district supplies. This would enable us to make the maximum use of the capital cost of that main, despite the fact that it would no longer be serving its original purpose.

As an example of comparative costs. Prior to our taking over, Board headquarters had suggested that one length of 10 in. M.P. main from Oystermouth Road to Mumbles should be fitted with dresser clamps. The main itself was 4½ miles long, but for our initial purposes we considered the first 2 miles out of the works. The cost of relaying 2 miles of this main compared with the fitting of dresser clamps is as follows:

Estimate 3,360 yards of new 10 in. main, laid for H.P. in a road with a 4 in. asphalt carpet at an inclusive cost of £5 10s. per yard, including reinstatement	£16,800
Allow for 10 in. governor, kiosks, valves, licence for governor site, foundations and connections ...	700
Total	£17,500

Total inclusive estimation for dresser clamps, 10 in. governor, kiosk, valves, licence, foundations and connections, etc.	£10,500
This work which was commenced on October 4, 1955, has now been practically completed except for approximately two-thirds of the final reinstatement; estimating for this on the basis of the one-third already charged the final actual costs will be in the region of	£9,400

Evidence Sought

It will be remembered that we had sought independent evidence of the condition of the cast iron pipes, which confirmed them as perfectly sound; the fitting of the dresser clamps on every 9 ft. joint, made the joints completely gas tight. So that the work has been carried out for a little more than one-half of the cost of a new main of the same size; it is reasonable to assume, however, that if a new main had been laid it would have been of a larger size to give a greater measure of security for the future. So that the saving in actual expenditure has been considerable.

At the Board's request, we had submitted to the Distribution Engineer on March 4, 1954, our preliminary ideas when we suggested that the whole position could be best considered in three districts.

DISTRICT ONE, Port Tennant and the east side of the River Tawe.

DISTRICT TWO, the area of Swansea Borough which is supplied via Morriston works. This is, roughly, all north and west of a hypothetical line drawn from High Street station to south of Cockett station and Waunarlwydd Road.

DISTRICT THREE, all south of the hypothetical line referred to under District Two above. which includes Sketty, Killay, Langland, Mumbles, etc.

The future developments may be seen on the plan of the district in Fig. 1.

We did, however, add one additional section to our report, **'DISTRICT FOUR'**—Town Centre. At that stage, however, we could not include costs or estimates for the mains modifications since we were working under such difficult circumstances. The speed of our progress depended largely upon the rate of progress of other parties, and when a large proportion of the cost should be recoverable from the authorities we felt it would be unwise to attempt such a task at that stage.

There was one point we had to cover, however. At that time, lunch-time pressures leaving the works on the L.P. governor outlets were 18 in. W.G. on Sundays and 12 in. on week-days, in order to maintain minimum statutory pressures at the extremities. This was bound to give over-gassing of appliances near the Oystermouth Road works and increase unaccounted-for-gas so our proposals then simply amounted to the fixing of some 3,000 service governors. Of these, 595 had been fitted before capital expenditure control caused the project to be deferred; as and when the position eases we intend to proceed with this work.

Out of the 18 in. L.P. main (Town West) there had been approximately 1,500 yards of 10 in. and 12 in. main laid travelling north west and connected back into the L.P. system before reaching Parc Beck Hospital. We were informed that, at the time of laying, it had been intended that this main should be extended through Sketty on to Killay, but having regard to the reversal of policy to higher pressures and smaller diameter mains, we considered that this main was required for the area in which it connected to the L.P. system, and this was subsequently agreed by the Deputy Distribution Engineer.

The main effect, therefore, in our proposals of Districts, was to relieve the Town West L.P. system of the necessity to supply the further reaches of Gower Road, Wimmerfield, Killay and Upper Killay, and to transfer this load to the 10 in. M.P. Mumbles/Langland main, by converting the latter to H.P. and eventually building up to 15 lb. per sq. in. or more.

Even so, Districts Two and Three were so extensive that it was clear that they would have to be sectionalised to enable the work to be carried out and individually authorised by the Board for implementation and capital expenditure.

The report was bound to be an extensive one; it must be in such a form that anything concerned with it either technically, commercially, or in its ultimate implementation, must be able quickly and easily to refer to the section or sections of immediate interest to them. It is not my intention to labour this point, but out of experience one realises that it is extremely irritating to receive ill-presented lengthy reports, however valuable the content may be. With a short report, a concise heading with appropriate sectional and sub-sectional paragraphs, is usually most acceptable. With an extensive report of this kind, covering the whole of our area of supply, we considered an index indispensable.

Summary Made

This index was immediately followed by a summary of recommendations with the estimated capital costs involved; it is more usual to place such a summary near the end, but the total initial cost involved is always a most important factor, particularly to the accountants and we accordingly gave it a prominent position. Then after a short introduction came details of the districts as previously outlined in this paper.

It was not, of course, sufficient to state just what we had decided to recommend. We felt it incumbent upon us to follow each of our recommendations with a statement of the advantages to be anticipated, and a complete lay-out drawing in the form of an appendix, for each individual section. After all it must be in a readily assimilable form if we were to obtain a quick decision on some of the proposals, where quick decisions were very necessary.

No report is complete without some endeavour to express the estimated costs, in terms of annual charges, which in turn should be expressed in pence per therm. Our original costs were based on 3½% per annum interest, with an amortisation period equivalent to the agreed Gas Council depreciation period for the particular type of plant or mains. No distribution plan however exhaustive, should be inflexible; if it were incapable of modification to meet different circumstances those those envisaged as they arise, without altering the main underlying principles, then I suggest it is not a good plan.

In our case the sections of the report dealing with mains were accepted in their entirety by the Board's technical committee with only two minor modifications; first, the addition of a variable outlet differential governor half-way up Killay Hill (District 3, Sect. 1) where there is a rise in elevation of some 350 ft. in about a mile of terminal main and secondly, the addition of a governor at Grove Place (District 2, Sect. 2).

With compressors, we only recommended one dual-drive machine of 250,000 cu.ft. per hour at the early stage, as our estimates indicated that a 350,000 cu.ft. machine would be necessary in seven to ten years' time. The advisability of installing duplicate machines of the same size and type as at other undertakings in South Wales was, however, brought to our attention after the submission of our report, and eventually it was agreed to instal duplicate dual-feed (gas/oil) machines, and to consider installing a third and larger one when the need appears to be likely. The first is now in course of installation. This together with the subsequent modification has increased costs above those originally estimated, as also has the increased interest of 4%.

The flexibility which the new mains give together with high pressures, can enable us to meet wide variations of demand with the minimum of capital expenditure, thereby considerably minimising the undesirable financial effects of capital invested in laying larger diameter mains which are never fully operative except as peak periods. Moreover, the future availability of the direct grid supply via Briton Ferry to Oystermouth Road works, combined with the modifications covered by our report will render unnecessary the former proposal to instal a H.P. gasholder and its own ancillary plant at Mumbles.

DISCUSSION

In the discussion which followed, **Mr. H. Blythe** (Colwyn Bay) said it was a paper based, not on hypothesis, but on an actual report submitted to the Board. He felt it was going to be a very useful paper particularly to those people who had had more training on works and less in the office and found themselves stumbling when it came to building up and preparing a report. Referring to the comparative cost of using dresser couplings, he asked, by how much the pressure had increased, and how successful was the method found to be after the ground had been filled in because the dresser coupling was not always the answer to leaking mains. Mr. Pickard said that present compressors only got up to 8 lb. As soon as the new compressor was in or grid pressures were introduced they would know.

Mr. H. Fitton: Presumably the saving of unaccounted gas is going to be confined to the sealing, but it does leave the services, many of which must be old, continually subject to this high pressure. What steps are taken to check their soundness? Apparently you took your test pieces and found them universally good, but have you done any other testing to old cast iron mains and found anything different? We have found some old mains in a graphitised condition and impossible to track with a main finder. Mr. Pickard replied: I have come across graphitisation in Llanelly but not in Swansea. There was a distinct old gas smell and discoloration of the ground when a main laid in 1908 was bared. I found that at one point, with an ordinary pocket knife I went right through in two minutes. As far as pressures were concerned, said Mr. Pickard, there was great flexibility in the scheme with a choice of a small, medium or large ring. Having got large mains of 18 in. and 15 in. it was possible to lead the smaller one back to the large one and equalise the pressures.

Moving a vote of thanks, **Mr. E. M. Edwards** complimented Mr. Pickard on the subject matter of his paper and the way in which it had been presented.

Certain points, he said, should be remembered, capital expenditure should be minimised and the best and most economic use made of existing assets, steam driven compressors should be scrapped. It never paid to use steam unless you had surplus steam. They had gone away too easily from gas—their own product—as a prime mover. A strong case could be made for the use of gas engines.

Seconding the vote of thanks, Mr. Fitton said it was remarkable how Mr. Pickard had prepared a report so soon after he had gone to Swansea.

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GAS BEATS PREJUDICE AGAINST USE FOR HEAT TREATMENT OF LIGHT METALS IN U.S.

GAS-FIRED heat treating furnaces for aluminium and magnesium are in wide use now, after a long period of real or fancied objections that stemmed largely from the activities of competitive electrical equipment manufacturers and, in fact, of one of the largest of the light-metal producers.

There is no known reason why the gas industry should not take on all of this business both on the basis of cost and metallurgy, Mr. C. George Segeler, Utilisation Engineer, American Gas Association, stated at a conference of the AGA industrial and commercial section. Evidence to confirm this is readily available from recognised sources, he added.

It should not be very difficult to sell gas for heat treating aluminium and magnesium, if competitive costs were the only consideration, with electricity costs generally higher in America. But, Mr. Segeler emphasised, selling gas for this industrial use depends on convincing industrialists that the metallurgical results as well as the cost will be satisfactory or better.

Objections to gas have been difficult to overcome. Principally, they were fears that products of combustion would damage the metals or that gas equipment could not provide sufficiently uniform temperatures. The problems were acute in treatment of wrought aluminium, less acute with sand castings and least significant with permanent mould castings.

American suppliers of aluminium generally do not take a strong stand on the selection of energy source, but their leaning has been clearly toward electricity because it eliminates any question of furnace atmosphere. Consequently, electrical equipment is too often specified. This points up metallurgical factors as the alleged reason for superiority of electrical equipment.

Higher Melting Temperature

The heat treatment discussed by Mr. Segeler before the AGA group is known as solution heat treatment, in which the metal is brought to a temperature high enough to permit alloy particles to dissolve while everything is in the solid state. The hotter the metal, the quicker this will occur. That, he said, is where the trouble can begin. The alloy particles have a melting temperature which is a bit higher than the desirable solution temperature.

Any error in furnace design, inaccuracy in temperature control, or improper furnace loading could cause trouble. Some of those considerations were overlooked, at least as to their criticality, in the earlier experiences. It is necessary to convince plant metallurgists, Mr. Segeler stressed, that there will be no trouble from these causes and that there will be no reaction between flue products and metal.

With the metallurgical considerations uppermost, the various situations might best be approached separately. In solution heat treatment of sand castings, direct-fired furnaces using external air heaters can and are being used. Certain alloys are more critical than others. High accuracy of temperature control is essential and calls for correctly calibrated instruments that will provide the actual temperatures of the parts being heated; temperature must be uniform throughout the load, plus or minus 5°F. These requirements must be judged with a full work load in the furnace.

It has been observed that castings which have test coupons barely meeting physical property requirements are more likely to cause difficulties in direct-fired furnaces. Alloys high in copper with little or no magnesium, or magnesium alloys with no silicon, can be processed readily in direct-fired furnaces. Permanent mould castings are more easily handled in direct-fired furnaces, presumably because of denser structures. Excessive dissolved gas is likely to cause blistering. Sound structure, however, will resist penetration by either moisture or SO_2, at proper furnace temperature. Wrought alloys generally are more difficult to handle. Consequently, indirect-fired ovens are used widely, unless tests show that the parts in question can be treated in the presence of flue gases. The American controlling specification, MIL-H-6088, sets forth the details of testing furnaces for suitability.

In support of his conclusions favouring gas equipment, Mr. Segeler cited an article by two authors, Mr. H. J. Rowe and Mr. W. E. Sicha, of the Aluminium Company of America, who were quoted as having written: 'Gas furnaces in which the products of combustion are circulated, when suitably designed, can be used satisfactorily in many cases, provided that the atmospheres contain a sufficiently high CO_2 percentage and are free of sulphur and excessive moisture.'

While the general metallurgy of magnesium heat treatment was described by Mr. Segeler as analogous to that of aluminium, primary interest is centred in castings, as far as solution heat treatment is concerned. Originally, electrical equipment was always specified, largely because of the experience of the prime producer of magnesium, who found it necessary to specify a sulphur dioxide atmosphere to minimise the danger of fire.

During the last war, gas ovens were demonstrated successfully for heat treatment of magnesium castings. Furnace design and accurate temperature controls were the contributions of the equipment manufacturers that made good results possible. CO_2 was found to inhibit oxidation of magnesium, thereby providing the same fire protection as SO_2 in an electrical oven. However, military specifications did not recognise the American gas industry's position on that point.

In 1950, a new military specification was issued, repeating the same restrictions. Fortunately, the Air Force and other agencies were willing to grant exceptions. As a result, some direct-fired furnaces were approved for certain alloys. In many of these installations, however, inspectors insisted upon equipment for maintaining an SO_2 atmosphere of 0.3%. The gas industry felt that this was undesirable and unnecessary.

There were numerous conferences in Washington and suggested revisions were proposed. No answer was forthcoming. Such gas ovens as were sold, were approved one by one for the job and for the alloy. Finally, the military specification was changed and gas ovens are now accepted under the new specification, MIL-M-6857A.

In line with the gas industry's requests, a CO_2 atmosphere is permissible, furnishing the best single argument in favour of gas: get rid of SO_2. This gives the added advantage of offering greater furnace flexibility, since both aluminium and magnesium can be treated in the same furnace without a lengthy purge period to remove SO_2 before charging with aluminium.

A report on the use of gas by Bendix Aviation Corporation was referred to by Mr. Segeler. It shows that castings have higher and more consistent physical properties and the foundry's fire record has been outstanding since gas equipment was adopted. The Bendix metallurgist states that, in 13 years of experience, no physical failure of products from heat treating furnaces has been attributable to either the heating operations or the use of CO_2 atmospheres in the furnaces.

New Dry Purification Material

THE Hamburg gasworks have experimented with the replacement of oxide by the residue from the Fe-extraction plants of the waterworks, writes K. H. Schmidt in the March issue of *Das Gas- und Wasserfach*. This so-called 'W-oxide' contains on an average 50% of Fe_2O_3 and 18% of SiO_2 with 20% of loss of weight after calcination and is available in large quantities. Its moisture content of up to 70% can be reduced to 50% by spreading it out in the open air. Its pH-value lies between 6 and 6.8. In some tests, up to 50% of revivified oxide from the water gas process was added to obtain better scarification.

Activity tests in accordance with Dr. Haarmann's method proved the superior H_2S-absorptivity of W-oxide compared with any other oxide or mixture. When the first large-scale run with this W-oxide had to be discontinued for operational reasons after nine months, the sulphur content in the W-oxide was found to be 42%, referred to the dry state. The run was judged to be satisfactory and it is hoped to derive benefit by the use of this material.

GAS IN FRANCE

Underground Storage

GAZ DE FRANCE has been fortunate in finding, quite near to Paris, its biggest and densest area of supply, two geological formations which lend themselves to the underground storage of gas. Where such formations exist, suitably situated and of significant capacity, they must be of immense value. They may even contribute to the solution of the problem of seasonal peak loads, and facilitate the transport of gas over long distances, permitting the operation of gas-making plant at a reasonably constant rate throughout the year. It is easy to see how attractive such a situation was to the Paris region of gas supply, which is already drawing large volumes from the coal and iron districts of Lorraine and the Saar.

A description of the structure at Beynes, situated some 13½ miles west of Versailles, had already been published. It was repeated in more detail in a paper presented to the Annual Congress last month of the Association Technique de l'Industrie du Gaz de France by M. Delsol and M. Richard, of the Research Department. The site is partly equipped and has been receiving coke oven gas since the end of November, 1956.

Briefly, the formation consists of a porous stratus lying in the form of an inverted bowl, closed above and below by impervious strata. Borings revealed two beds of sand, one at a depth of about 890 ft., the other at 1,300 ft. The upper bed was already providing a certain amount of potable water by way of artesian wells. It was therefore decided to proceed with the exploitation of the lower bed for the gas storage.

Paraphrasing the paper referred to above: The structure at Beynes is in the form of a very flat inverted basin, roughly elliptical in plan, with an effective length of 2.18 miles by a width of 1¼ miles and a useful surface of the order of 2.3 sq. miles. The thickness of the storage bed is some 30 metres. It consists of fine sand with a total porosity of 30 to 35% and a useful porosity (deduction being made of interstitial water) of 21 to 25%. A test of injection and withdrawal of a small quantity (about 2 mill. cu.ft.) of gas in the summer of 1955 showed that water circulated in the bed with great facility and that the 'water-drive,' the hydrostatic reaction expelling the gas, was intense.

The vertical height of the 'inverted basin' is of the order of 100 ft. and the initial hydrostatic pressure is in the region of 38 atmospheres at the depth of 1,000 ft.

The 'cover' is constituted by a bed of plastic clay at least 7 metres thick, assuring a sufficient gas-tightness. One of the objectives of the preliminary survey was to prove the continuity of this gas-tightness over the whole area. Exact measurements of pressures were taken at different points and particularly in the water-bearing strata lying immediately above and below this bed of clay. During the injection of some 1,000 mill. cu.ft. of gas into the reservoir, the control wells revealed no leakage.

Varying Volume

The total volume of gas which can be stored will no doubt vary, according to conditions of exploitation, some of which remain to be determined, between 9,000 mill. and 12,000 mill. cu.ft., while the 'cushion' of gas appears likely to be between 4,300 mill. and 5,700 mill. cu.ft. for a depth of penetration of 6 metres of the wells into the storage bed.

There are some difficulties. In a second paper by the same authors they describe the special treatment of coke oven gas which is necessary before it can safely be injected into underground storage of the kind found at Beynes. It is necessary to eliminate very thoroughly any constituents of the gas which might lead to the contamination of the sand bed, particularly the closure of the pores. Gas under relatively high pressure lying in a very porous medium may undergo transformation of some of its constituents leading to the formation of gums, closing the pores and perhaps rendering the reservoir unuseable. It is reported that in a case near Pittsburgh where coke-oven gas was stored without special treatment the underground storage ground had to be abandoned after some months of injection. On the other hand, German engineers, warned by the American experience, have installed a system of special treatment at Engelbostel and they have succeeded in operating their underground storage for two years without any signs of this trouble.

At Beynes it was also necessary to preserve the integrity of the waterbearing stratum, in view of Government instructions that the possibility must be preserved of using the water for urban consumption. This was a new problem. It was necessary to effect the elimination as completely as possible of constituents, even though these were found in small proportions, of the gas to be injected, such as gum-forming hydrocarbons, indene, butadiene, etc., and aromatic hydrocarbons, phenols, sulphur compounds, cyanides, ammonia, etc., which might pollute the water. Routine purification is insufficient.

Valuable Results

The plant installed (described in a second paper by M. Pilloy and M. Asselineau) consists of de-dusting (by washing with gas-oil) before compression, the elimination of oil-fog by filtering after compression, treatment over activated carbon and a final dust elimination. This plant is now ready for operation on injections to begin this month and it is hoped to obtain valuable results during the next short period. The determination of very small proportions of deleterious constituents in the ordinarily purified gas is evidently a matter of great importance and suitable methods have been studied in the research laboratories at Landy. These are reported in yet a third paper by M. Boivin and M. Giampoali of that organisation.

The other formation near Paris suitable for underground storage is situated in the Pays de Bray, some 50 miles to the north-west. This has still to be surveyed and developed.

In view of the interest in this country in possible developments in the underground storage of gas, all these papers are worthy of careful study.

Measurement of Air Flow—Revised British Standard

THE methods specified in the revised publication—'British Standard for Measurement of Air Flow for Compressors and Exhausters'—Bs. 726:1957—are consistent with the principles stated in B.S. 1042, 'Code for flow measurement,' The two standards are complementary: the Code dealing with the design, installation and use of standard pressure-difference devices and B.S. 726 concentrating on standard testing methods for compressors and exhausters.

New features are the inclusion of requirements for a nozzle of $\frac{7}{32}$-in. nominal diameter for use in the method for the measurement of air flow by means of a nozzle in the pipeline; and requirements for perforated plates for insertion in the pipeline when testing with a nozzle on the delivery side of a machine. Also new is the section 'Measurement of air flow at the inlet, using a conical intake,' which includes particulars of the intake and the associated pipelines.

As in the previous edition, a table of dimensions of nozzles is included, along with drawings of the smaller sizes of nozzle. Guidance is given on the selection of a suitable size of nozzle or intake and there are particulars of the instruments for pressure and temperature measurement. Methods of calculation are provided; and appendices give the derivation of the equations of flow through nozzle and intake.

Copies of this standard may be obtained from the British Standards Institution, Sales Branch, 2, Park Street, London, W.1. Price 6s.

Trade News Supplement

CAMBRIDGE MODEL DE ELECTRONIC RECORDER

THE Cambridge Model DE electronic recorder forms part of complete Cambridge equipment for temperature measurements, gas analysis, determination of pH values and calorific values of gases, detection of dissolved oxygen in feed water, radiation intensity, etc.

It can be supplied as a single unit for numerous applications in science and industry, and will measure any quantity that can be converted into a small DC signal. It employs a powerful closed-loop servo-mechanism of high sensitivity, accuracy, and fast speed of response.

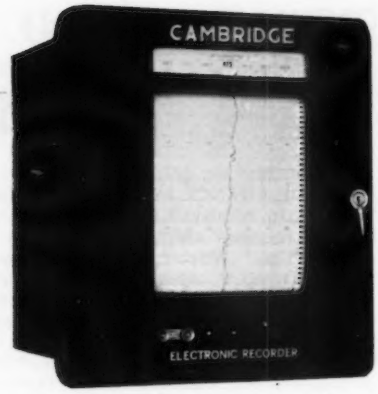
Clean functional design of electrical and mechanical components ensures trouble-free running over long periods, and normal servicing comprises only pen filling, chart changing, and periodical gear lubrication. The intrument is highly versatile in that the self-contained plug-in amplifier unit can be replaced within minutes and the range changed on site by simply unsoldering and resoldering 7 conveniently placed connections. Hand change gears select chart speeds ranging from ½ in. per hour to 6 in. per minute.

The standard potentiometric version, whether single or multi-point, will respond to a change in input signal of less than 1 μV for the minimum range of 1 mV full scale, and record a full scale error signal within 2 seconds. The overall accuracy is ± 5 μV and higher range instruments have the same relative accuracy and sensitivity. When arranged as a current balance, ranges down to 0.2 μA can be provided.

Power Available

The controllers incorporate a mechanical error generating system with enough power to operate multiple switches, slidewires, magslips, pneumatic transmitters, and other similar control devices. The necessary auxiliary equipment is designed on the unit principle and is mounted on a standard sub-chassis.

Single-point instruments may have up to six independently adjustable cams operating SPCO microswitches at predetermined recorder settings (for control, alarm, warning lights, etc.). Multi-point instruments may have cams arranged to provide common alarm on all points, or to provide ON-OFF control on all points independently. Pneumatic proportional control providing a proportional band adjustable between 2 and 600% or transmitting directly into a 3-term controller can also be supplied.—*Cambridge Instrument Co., Ltd., London and Cambridge.*



The Model DE electronic recorder.

Publication Received

Transformers Described in Three Books

THREE well presented and excellently illustrated new publications have been issued by the Hackbridge and Hewittic Electric Co., Ltd., giving details of their wide range of transformers.

Some indication of the wide and and varied experience which the Hackbridge and Hewittic Electric Company has had in the manufacture of transformers can be gained from the fact that since their inception more than 30 years ago, Hackbridge transformers aggregating 24 mill. kVA have been despatched to all parts of the world.

The benefit of this experience is passed on to the user in these three publications which give details of construction, operation and application of the Company's products.—*Hackbridge and Hewittic Electric Co., Ltd., Walton-on-Thames, Surrey.*

Nu-Swift Launch New Dry Powder Extinguisher

A REVOLUTIONARY dry powder fire extinguisher, claimed to be so easy to operate that even a child can use it, which kills a fire in only a few seconds, has been introduced by Nu-Swift, Ltd.

It has been specifically designed to combat fires long rated the most dangerous of all—those on inflammable liquids of all types, including alcohols and industrial solvents and electrical equipment. Efficiency greatly in excess of any other extinguisher of comparable size on the market is claimed for it.

This new Nu-Swift extinguisher has four advantages—the dry powder is held, with dried carbon dioxide, in a sealed pressure charge so that it cannot be affected by atmospheric humidity; scientific preparation, mixing, grinding, sieving, and drying of the powder ensure that all particles are regular in shape and size; electrostatic coagulation is prevented by special treatment during manufacture; and ingredients liable to bacteriological spoilage are not used.

Amazingly compact in spite of its astonishing fire fighting qualities, the Nu-Swift extinguisher, which is designated Model 1604, is only 15⅞ in. high and weighs 10½ lb.

When the operating knob is struck, a fan-shaped cloud of fire-killing powder is expelled through the nozzle with a range in still air of 10 ft. at 65°F. The cloud is 4 ft. wide and 2½ ft. deep.

Re-charging can be carried out in 30 seconds and the extinguisher needs the minimum of attention. Discharge time is eight seconds.—*Nu-Swift Ltd., Elland, Yorkshire.*

Shell Develop Special Lubricants for Nuclear Power Stations

SPECIAL products developed by the Shell Petroleum Co., Ltd., will be used in the operation of the first of the Central Electricity Authority atomic power stations at Bradwell, Essex, which is being built by the Nuclear Power Plant Company.

When initial schemes for atomic power stations were being considered several years ago it was realised that among the important problems to be tackled would be the lubrication of plant subject to radiation.

Under the influence of radiation, molecules can absorb large amounts of energy. As a result the molecules become, in chemical terms, 'excited,' and, depending upon their structure, can break down into highly reactive fragments. In the case of conventional high quality lubricants these fragments can then combine with neighbouring molecules to form compounds of higher molecular weight, as shown by significant increases in viscosity of the irradiated material which may even become completely solid.

Shell have produced a range of radiation-resistant lubricating and hydraulic oils and greases under the brand name Shell A.P.L. to meet requirements of nuclear power stations, and further research continues at the Company's Thornton research centre to provide lubricants for the nuclear projects of the future.—*The Shell Petroleum Co., Ltd., 1, Kingsway, London, W.C.2.*

PUBLISHERS' NOTICE

The " Gas Journal " is published every Wednesday, price 1/6d.; by post 1/8d.

Subscription Rates:—65/- per annum; (Payable in advance.) A copy of the " Gas Journal " Calendar & Directory is presented each year to continuous subscribers.

Classified Advertisements: All small classified advertisements are charged at 2/6 per line (approx. 7 words)—minimum charge 10/-. A Box Number address occupies 2 lines, and a further 6d. is charged towards cost of postage on replies. Copy must be received by first post on Monday to ensure insertion in that week's Journal.

Displayed Advertisements: Rates obtainable on application to the Business Manager. Change of copy for displayed spaces must be received 14 days prior to publication if proofs are required. Type area of inside pages 10 in. deep × 7 in. wide; block screen 120.

BUSINESS MANAGER: S. T. CULLEN

NORTHERN MANAGER: Philip W. B. King, 11, Tewit Well Road, Harrogate. *Telephone:* Harrogate 69212.

SOUTHERN & MIDLANDS REPRESENTATIVE: A. Engelhardt, T.D., 11, Bolt Court, Fleet Street, E.C.4. *Telephone:* Fleet Street 2236-7.

WALTER KING, LTD., 11, Bolt Court, Fleet Street, London, E.C.4.

Telephone: FLEet Street 2236-7. *Telegrams:* Gasking, Fleet, London.

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PALMERSTON HOUSE, BISHOPSGATE, LONDON, E.C.2.

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FOR ORDINARY OR PREPAYMENT METERS, ANY CALORIFIC VALUE, OFFICE SIZE OR POCKET CHARTS

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354, WHEELER ST., BIRMINGHAM, 19
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NATURAL BRITISH.

BOG (DUTCH and DANISH) ORE.

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SPECIAL OFFER: 12 in. loose flanged tube in 18 ft. lengths, complete with joint rings, nuts and bolts. Reconditioned material. Delivery ex stock. Midland Iron & Hardware Co. (Cradley Heath) Ltd., Cradley Heath, Staffs. Tel.: Cradley Heath 6264-5-6.

SPECIAL OFFER: Large quantity of new cast iron fullway valves, all iron parts, 8 in., 10 in., 12 in and 14 in. for sale. The Midland Iron & Hardware Co. (Cradley Heath) Ltd., Cradley Heath, Staffs Tel.: Cradley Heath 6264 and 5.

FOR SALE: Pressure Vessels 30 ft. by 8 ft. 6 in. diameter for 100 lb. and 120 lb. pressure. Converted Lancashire Boilers. Cleckheaton Engineering Co. Ltd., Cleckheaton, Yorks. Phone 397.

PATENTS

KINGS PATENT AGENCY, LTD.
(Director, B. T. King, A.I.M.E., Patent Agent) Advice, Handbook, and Consultations free. 146a, Queen Victoria Street, London, E.C.4. 'Phone: City 6161.

APPOINTMENTS VACANT

ASSISTANT required in laboratory for work on domestic space heating and small industrial gas appliances.

Pension scheme. Salary commensurate with age and previous experience.

Apply, Bratt Colbran, Ltd., Lancelot Works, Wembley, Middlesex.

EAST MIDLANDS GAS BOARD

LINCOLNSHIRE DIVISION
TECHNICAL ASSISTANT—GAINSBOROUGH

APPLICATIONS are invited from suitably qualified persons for the post of TECHNICAL ASSISTANT at Gainsborough at a commencing salary within Grades APT. 5/6/7 (£605/£785 p.a.) according to age, qualifications and experience.

Applicants should preferably be in possession of, or studying for, the Institution of Gas Engineers High Grade Certificate in Gas Manufacture, or equivalent qualifications. They should also have had practical experience on a modern gasworks, with special reference to continuous vertical retort practice and auxiliary carburetted water gas plant.

The position is pensionable and the successful applicant will be required to pass a medical examination.

Application, giving details of age, education, training, qualifications and experience, together with the names of two referees should be addressed to reach the undersigned by not later than July 27, 1957.

BERNARD CLARKE,
Divisional General Manager.

Belle Vue House,
Carline Road,
Lincoln.

EAST MIDLANDS GAS BOARD

CHIEF INSTRUCTOR, AREA TRAINING CENTRE

APPLICATIONS are invited for the position of CHIEF INSTRUCTOR at the Board's Area Training Centre at Long Eaton, near Nottingham. The appointment will be made within Group B (£1,105-£1,265) of the National Salaries Table for Senior Gas Officers, the starting salary depending on qualifications and experience.

Courses are held at the Centre on a range of subjects—including Gas Fitter refreshers, Salesmanship, Distribution, Supervision, etc.—and are attended by all levels of the Board's employees. The base load of instruction is the responsibility of the Chief Instructor and a full-time Assistant Instructor, but visiting specialist lecturers both from within and outside the Board are drawn on as required.

The successful candidate will be expected to have:—

(a) A real interest and experience in teaching;

(b) a good knowledge of the Gas Industry, particularly in respect of utilisation, commercial and distribution matters;

(c) Associate Membership of the Institution of Gas Engineers or technical qualifications of at least the level of a good pass in Gas Technology (Supply);

(d) the ability to manage the Centre and the courses conducted there.

The post is pensionable and the successful applicant will be required to pass a medical examination.

Applications, stating age, education, qualifications, present appointment and previous experience, together with the names of two referees, should be received by the undersigned not later than July 15, 1957.

A. GWYNNE DAVIES,
Secretary.

Beverley House,
University Road,
Leicester.

July 3, 1957.

(*Classified advertisements continued on page* 100)

APPOINTMENTS VACANT (ctd.)

WALES GAS BOARD

PONTYPOOL UNDERTAKING
DISTRICT FOREMAN—CWMBRAN

APPLICATIONS are invited for the position of DISTRICT FOREMAN of the Cwmbran District of the above Undertaking.

Applicants must be First Class Gas Fitters and should have a wide experience including mainlaying, carcassing, appliance fixing and general district consumer service. Candidates must be able to drive and be in possession of a clean licence.

The salary will be within APT. Grade 4/5 Provincial 'A,' £465 to £685, placing according to qualifications and experience. The post is pensionable. The successful candidate will be required to pass a medical examination.

Applications, stating age, education, experience and qualifications, together with the names of two referees should be forwarded to the General Manager, Pontypool Undertaking of the Wales Gas Board, Gas Offices, Hanbury Road, Pontypool, Mon., within fourteen days of the appearance of this advertisement.

WALES GAS BOARD

PONTYPOOL AND ABERGAVENNY
UNDERTAKINGS
SALESMEN

APPLICATIONS are invited from suitably qualified persons for the position of SALESMEN in the above Undertakings.

The salary will be in accordance with the National Joint Agreement for Gas Staffs within Grades APT. 2/4, £405/£620. The commencing salary and grade will be according to qualifications and experience.

The successful applicant will be required to pass a medical examination. The posts are pensionable.

Applications stating age, experience and qualifications, together with the names of two referees, should be sent to the undersigned within fourteen days of the appearance of this advertisement.

A. FACER,
Engineer and General Manager,
Pontypool Undertaking.

Wales Gas Board,
Pontypool Undertaking,
Gas Offices,
Hanbury Road,
Pontypool, Mon.

WALES GAS BOARD

PONTYPRIDD UNDERTAKING
ASSISTANT ENGINEER AND MANAGER

APPLICATIONS are invited for the appointment of ASSISTANT ENGINEER AND MANAGER to the Pontypridd Undertaking, which receives unpurified gas from coke ovens and purified gas in bulk from the Board's grid system. To meet peak load demands, carburetted water gas is manufactured at the Undertaking's Works.

The applicant must have a sound knowledge of modern distribution practice, management and administration, and appropriate technical qualifications are essential.

The salary will be within Grade A.P.T. 10, Provincial A (£860-£960 per annum), and the post is pensionable. The successful applicant will be required to pass a Medical Examination.

Applications, giving details of age, qualifications, experience and present position, together with the names of two referees, should reach the undersigned not later than Wednesday, July 31, 1957.

L. GRAY,
Engineer and Manager.

Gas Offices,
Treforest,
Pontypridd.

£1,500 per annum commencing salary plus commission. Man or woman with merchanting outlook and experience in the chemical trade. Preferably technical knowledge but this not essential. Applicant would be required to travel abroad and if possible to speak French and German. Apply: No. 327, *Gas Journal*, 11, Bolt Court, Fleet Street, London, E.C.4.

SCOTTISH GAS BOARD

CENTRAL DIVISION
SERVICE AND SALES MANAGER—
DUNDEE GROUP

APPLICATIONS are invited from suitably qualified persons for the above appointment. The successful candidate will be responsible to the Divisional Service and Sales Manager for consumer service, showrooms, sales and publicity in Dundee, Newport and Tayport. Salary scale Group A/B £1,025-£1,265 per annum with placing according to qualifications and experience.

The post is pensionable and the successful applicant will be required to pass a medical examination.

Applications stating age and giving particulars of education, training, experience and qualifications, together with the names of two referees should be addressed to the undersigned within fourteen days of the appearance of this advertisement.

A. T. HERD,
Secretary.

26, Drumsheugh Gardens,
Edinburgh, 3.

June 26, 1957.

SCOTTISH GAS BOARD

HEAD OFFICE
CIVIL DEFENCE OFFICER

APPLICATIONS are invited for the above appointment at the Head Office of the Board in Edinburgh.

Applicants should hold appropriate qualifications in civil defence and should be fully conversant with the latest measures of defence against all presently-known forms of attack including thermo-nuclear attack. Experience in, or knowledge of the Gas Industry, whilst not essential, would be an added advantage. The successful applicant will be required to advise the Board on all civil defence matters and to establish an efficient civil defence organisation throughout the Board's Area.

The salary will be within Group 'A' £1,025-£1,145 per annum with placing according to qualifications and experience.

The post is pensionable and the successful applicant will be required to pass a medical examination.

Applications stating age, and giving details of education, training, qualifications and experience, together with the names of two referees should be sent to the undersigned within 14 days of the appearance of this advertisement.

A. T. HERD,
Secretary.

26, Drumsheugh Gardens,
Edinburgh, 3.

June 18, 1957.

SCOTTISH GAS BOARD

CENTRAL DIVISION

APPLICATIONS are invited from suitably qualified persons for the following appointments:—

1. GROUP DISTRIBUTING ENGINEER, DUNFERMLINE GROUP.

The successful applicant will be responsible to the Divisional Distributing Engineer for the Distribution of gas in the undertakings comprising the Dunfermline Group. Salary scale A.P.T. 11/12 £895-£1,070 per annum.

2. SERVICE AND SALES MANAGER, KIRKCALDY GROUP.

The successful candidate will be responsible to the Divisional Service and Sales Manager for consumer service, for showrooms, sales and publicity in the undertakings comprising the Kirkcaldy Group. Salary scale A.P.T. 10 £860-£960 per annum.

3. ASSISTANT ENGINEER, DUNFERMLINE.

The successful candidate will be responsible to the Assistant Group Production Engineer for the production of gas and coke at the Dunfermline Undertaking. Applicants should be experienced in the operation of continuous vertical retorts and C.W.G. plants. Salary scale A.P.T. 8, £745-£825 per annum.

4. WORKS SUPERINTENDENTS — ALLOA, STIRLING, KIRKCALDY, LEVEN.

A Works Superintendent is required for each of the above four undertakings. The successful applicants will be responsible to the respective Group Production Engineers or their Assistants where applicable, for the production of gas and coke in the works under their control. Applicants should be experienced in the operation of continuous vertical retorts and C.W.G. plants. Salary scale A.P.T. 7 £705-£785 per annum.

The commencing salary in each case will be dependent on qualifications and experience.

The above posts are pensionable and the successful applicants will be required to pass a medical examination.

Applications stating age, and giving particulars of education, training, experience and qualifications, together with the names of two referees should be addressed to the General Manager, Central Division, the Scottish Gas Board, Friarton, Perth, within 14 days of the appearance of this advertisement.

A. T. HERD,
Secretary.

26, Drumsheugh Gardens,
Edinburgh, 3.

June 26, 1957.

DOMESTIC

UTILISATION OF GAS

SMITH & LE FEVRE

20/- *inc. postage*

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Now being issued in 10 self-contained sections. Sections available, and prices, as below:

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,,	5	REFRACTORIES: COAL AND COKE HANDLING	7s. 9d. ,,
,,	6	GOVERNORS: EXHAUSTERS: STATION METERS	9s. 9d. ,,
,,	7A	GAS COOLING and TAR FOG REMOVAL ..	15s. ,,

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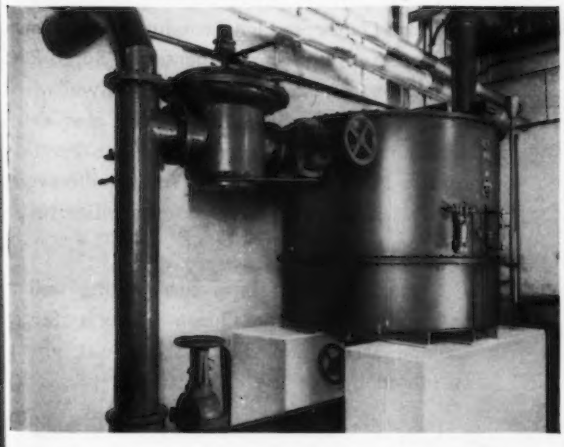
The Civic Hall, Leeds.

Since its introduction into this country in 1931, thousands of B.M. Industrial Consumers' Meters have been installed in establishments ranging from hospitals to factories and from colleges to department stores.

This meter, which is approved by the Ministry of Power for the sale of gas, is suitable for the measurement of either purified or unpurified gas at pressures up to approximately 2lb. per sq. inch. High pressure meters are also available.

For full details please write for Publication No. 51 /5

A B.M. Meter installed at the Civic Hall, Leeds.



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3,500 BORED PILES

This important Office Building in the City of London, 17 storeys high including the basement floors, is supported on Cementation Bored Piles. Approximately 3,500 were constructed well within the contract time despite the fact that delays were unavoidably occasioned by the deliberations on the fate of the Mithras Temple discovered on the site and other major difficulties inevitable on such a large site.

The construction of a surrounding wall to retain the adjoining Queen Victoria Street, Cannon Street and Bucklersbury was greatly facilitated by the use of our bored piles.

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The CEMENTATION COMPANY LIMITED

London Office: 20, Albert Embankment, S.E.11. Telephone: RELiance 7654

BENTLEY WORKS, DONCASTER. Tel: 54175-6-7-8-9

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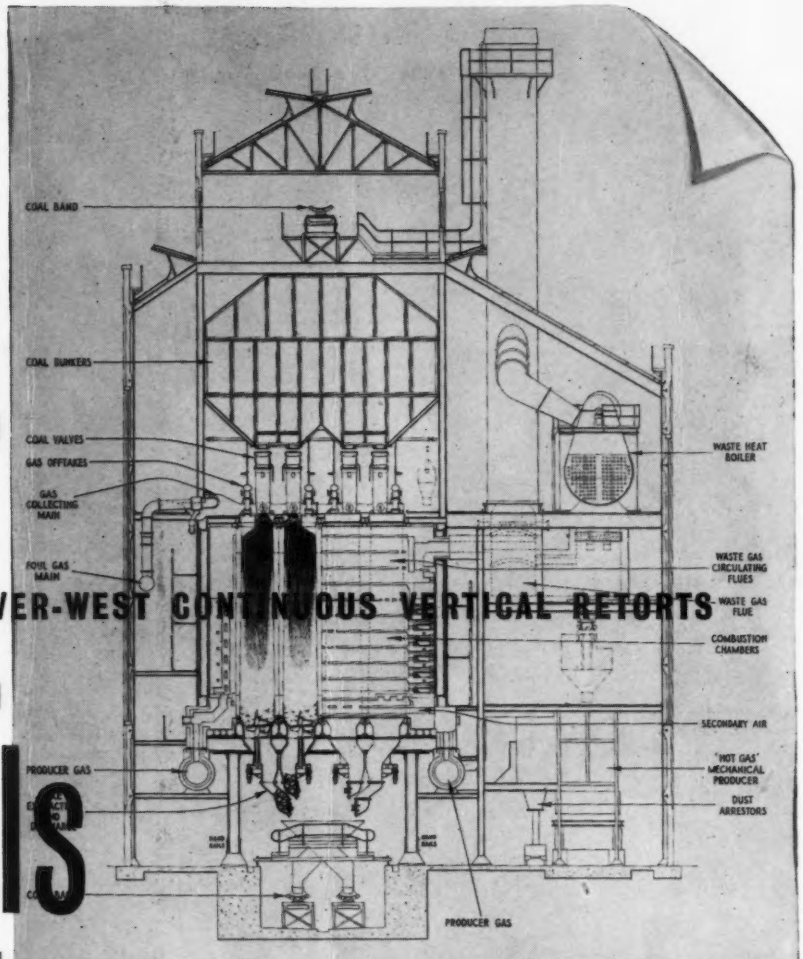
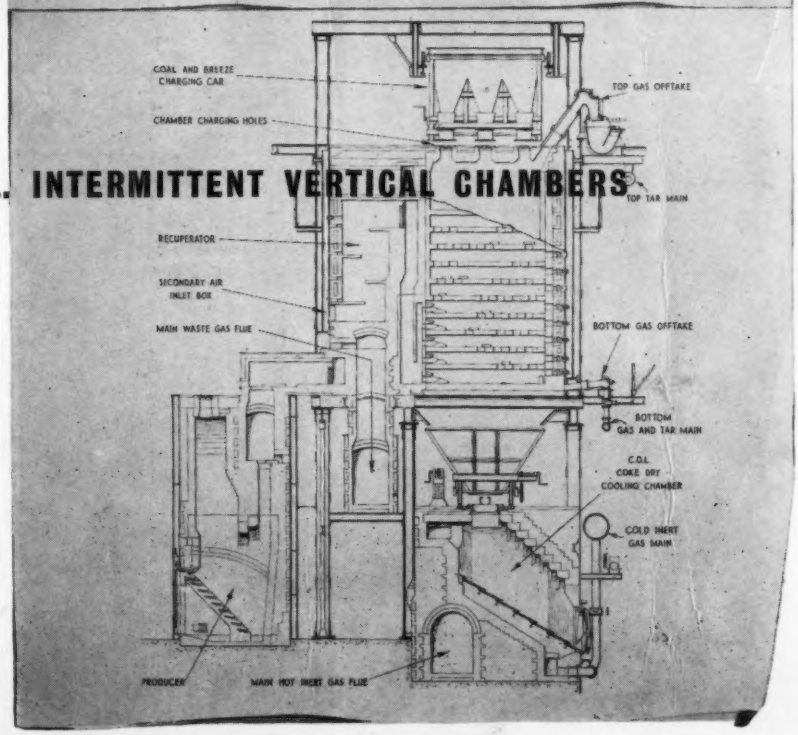
West's for Verticals



GLOVER-WEST CONTINUOUS VERTICAL RETORTS



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el: COLlyhurst 2961. Grams: Stoker, Manchester

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Tel: HOLborn 4108

.O.L. Div: Chandos House, Buckingham Gate, S.W.1.

4 more

SEGAS

plants

Orders received recently from town gas undertakings include:

Lowestoft	2·0 million cu. ft./day
Reading	7·0 million cu. ft./day
Palermo	3·6 million cu. ft./day
München Gladbach	1·2 million cu. ft./day

234

PGC

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